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VICTORIA

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HON. W. G. McKENZIE, M.L.A.,

Minister of Agriculture

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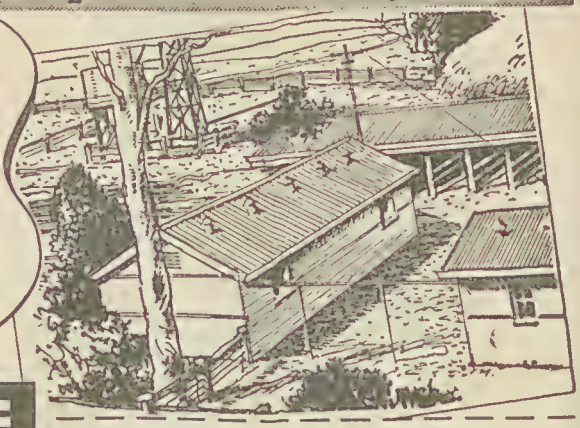

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SHEEP FEEDING TEST

By H. J. SIMS, M.Agr.Sc., Dip. Com., Manager, and C. G. WEBB, M.Agr.Sc., Agricultural Research Officer, Mallee Research Station, Walpeup.

FOLLOWING a very dry season in 1943, farmers and graziers in Northern Victoria experienced in the following year a disastrous drought which lasted from August, 1944 to July, 1945. Before the end of 1944, both paddock feed and fodder reserves on the farm were practically exhausted and most sheep owners were faced with the alternatives of marketing their stock at sacrifice prices, finding agistment or hand feeding for an indefinite period. It was difficult to obtain bulk fodders or oats, but limited supplies of wheat were available at reasonable costs.

These lambs and their mothers, at the Mallee Research Station, were fed on wheat until July, 1945, after which they were grazed on green oats.

The use of wheat by itself for the maintenance of sheep is seldom contemplated, as usually some bulk fodder can be obtained, even if there is no roughage in the paddocks. In fact, many farmers questioned whether sheep, particularly breeding ewes, could be maintained on wheat alone for an extended period.

It was anticipated that autumn rains would bring paddock feed by April, but nevertheless the prospect was for three or four months of hand-feeding with wheat.

To study the question it was decided to feed, at the Mallee Research Station, Walpeup, one hundred breeding Merino ewes on wheat alone until paddock feed came. They were placed in a small paddock completely bare of feed in mid-November and kept there for eight months, by which time the green feed commenced to show after the June rains. For the whole of the period wheat was fed at the rate of .9 lb. per day per sheep and although the ewes lost some weight, they lambed satisfactorily in April, 81 lambs being dropped of which 51 survived, finally being sold as trade lambs at the average price of 19s. 6d. each. Mortality of the ewes was fairly heavy after the rain came in June, but 75 of the original 100 ewes survived and were later shorn, cutting 6·8 lb. of wool per head appraised at 7s. per fleece.

Thus it was demonstrated that ewes could be maintained on wheat alone for a lengthy period, and even rear lambs on such a limited diet.

The actual cost of wheat fed to the ewes was £65, which works out at the high figure of 17s. 4d. per head on the 75 which survived. High as this figure is, it is less than the value of the lambs and wool produced, and in addition there remained 75 ewes with a value of at least £100 compared with the 100 ewes which, if not fed, would have had to be sacrificed for approximately £50.

A more complete account of the drought feeding trials at the Mallee Research Station will be published in a subsequent issue of this Journal.

Whole Wheat versus Crushed Wheat

During the period of hand feeding many enquiries were received at the Mallee Research Station concerning the advisability of crushing wheat instead of feeding it whole. Some people reported better results when using crushed wheat. It was decided, therefore, to start a small trial to obtain more information on the value of crushing wheat for feeding to sheep as, if better results were obtained, it may reduce handfeeding costs.

Accordingly, 50 aged ewes which had not lambed or whose lambs had died, were divided by alternate drafting into two groups. These sheep were run under similar conditions, that is, in a 20 acre bare paddock which had been sub-divided into two sections. The two groups were fed similar amounts of grain, whole wheat being fed to one group and crushed wheat to the other. No other supplementary feed was given. The rate of feeding was ½ lb. per head per day. The experiment was kept going for three months and then discontinued as there was then ample feed available for all stock.

The average weights of the two groups appear in the table which shows that no advantage was gained by crushing the wheat before feeding. In fact, early in the experiment, the crushed wheat group lost slightly more weight than the whole wheat group but, at the last two weighings, there was no difference in either. Much of the initial loss of weight is attributed to the weather conditions following the break which occurred on the 15th June, 1945.

In making comparisons between whole and crushed wheat, the cost of crushing (about 1s. per bag) is an additional factor that must be given consideration. When wheat is crushed it is essential that sufficient troughing be available for feeding it in, but whole wheat can be fed on hard ground if troughs are not available.

WHEAT FEEDING TRIAL 1945.
Average Weights of Ewes.

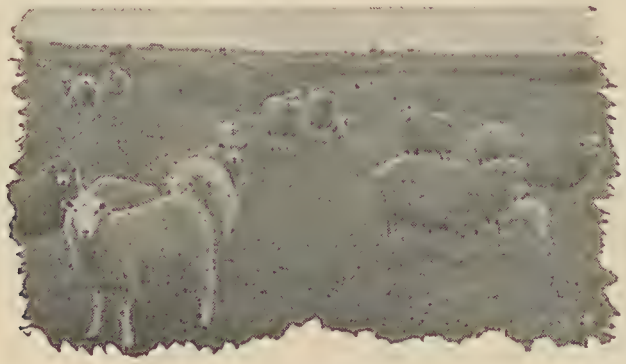
Date.	Whole Wheat.	Crushed Wheat.
	lb.	lb.
June 5	76·7	76·5
June 26	70·7	68·1
July 13	69·1	65·5
August 13	66·5	66·3
August 29	68·0	67·5

Feeding Wheat twice a Week

In other trials at the Mallee Research Station, the possibility of feeding sheep at wider than daily intervals has been investigated, and it was found that, after sheep have become thoroughly accustomed to wheat, it was possible to feed two or three days' ration at once without harmful effects—in fact, one group was fed twice a week for a month and showed similar weight variations as sheep fed daily. At the time the daily ration for each group was ½ lb. whole wheat.

Conclusion

The results of the trials at the Mallee Research Station have demonstrated that sheep can be kept over a drought period solely by handfeeding on wheat, that no advantage has been demonstrated by crushing wheat before feeding to sheep, and that, when the sheep become accustomed to wheat feeding, it may be satisfactorily fed out twice a week only at the rate of ½ lb. per sheep per day.



PASTURE INVESTIGATIONS

By W. D. ANDREW, M.Agr.Sc., Agrostological Research Officer

Extracts from the 1944-45 Annual Report of the Department of Agriculture to the Victorian Pasture Improvement League. The first portion of this report was published in this Journal for November, 1945.

Pasture Improvement in Gippsland

THE greater part of Gippsland that is suitable for agriculture lends itself to pasture improvement by virtue of its good soil and adequate rainfall. There is, however, an area of country between Traralgon and Bairnsdale where conditions are relatively dry and the soils light in texture, while along the coast, soils are poorly drained and low in fertility. The soils derived from silurian and granitic formations in the northern part of Gippsland are generally only of moderate fertility.

In general, perennial rye grass, cocksfoot, subterranean and white clovers are suitable species to sow in most parts of Gippsland, but on the drier country "phalaris" and subterranean clover would be more permanent than the others. Lucerne grows well on the deep red soil while strawberry clover, birdsfoot trefoil and the two species of paspalum are well suited to wet places. Kikuyu is finding favour as a summer-growing species on some of the less fertile soils where moisture is available during the warmer months, but is a disadvantage where cultivation is contemplated.

Good mixed pasture on Trafalgar flats developed by top-dressing with superphosphate.

On the poor coastal country such as the land between Wonthaggi and Foster, although white clover grows fairly well at first, the other common improved pasture species develop slowly until fertility is built up, and during the initial stages it is sometimes necessary to depend upon such species as nodding clover, birdsfoot trefoil, wallaby and fog grasses.

In its natural state this "plains" country carries a low dense scrub which can be easily turned under with the plough or rotary hoe and the usual practice is to grow oats or summer crops for a season or two to sweeten the soil before sowing down to pasture.

The soils, generally, are poorly drained and very acid in nature, and lime is necessary in addition to "super.". A trial at Inverloch has shown a marked response to as little as 2 cwt. of agricultural lime.

When sowing leguminous plants of any kind on this coastal country, inoculation with root nodule bacteria is recommended. As the fertility of the soil builds up with regular top-dressing with "super.", rye grass and subterranean clover develop almost spontaneously.

Light country in South Gippsland carrying a stunted vegetation dominated by tea tree. Use of "super.", lime and seed inoculum will ensure development of good pasture on this type of land.

Most of the grey-soil hill country in Gippsland will carry good pasturage if regularly "supered" and not overgrazed; but some of the poorer soils where the clay is near the surface would probably benefit from a dressing of lime.

The red hill country on the other hand generally responds to lime in addition to "super." and the recommendation is to use 6 to 8 cwt. of agricultural lime per acre.

There is evidence of potash deficiency in the lighter sedimentary soils in a number of places, notably Longwarry, Traralgon and Foster. Because dairying is general it is probable that this deficiency is more widespread than is realized.

To combat the tendency towards potash depletion and to reduce expenditure on artificial fertilizers it is recommended that farmyard manure at the milking shed be conserved and returned to the pasture land in the form of liquid manure. Conservation of soil fertility is an important aspect of pasture improvement on dairy farms in Gippsland.

Pastures that are not adequately fertilized, soon lose vigour and become invaded by such species as fog grass, "bidgee widgee," "flat weed," bracken fern and ragwort. Once these plants become strongly established, their elimination by top dressing alone may be impracticable, and slashing, burning and even cultivation may become necessary. In conjunction with these mechanical aids, sheep can be very useful in controlling blackberry and ragwort, while cattle are better for eradicating bracken. On many of the flats in Gippsland paspalum is common in the pasture, and if not liberally top-dressed and kept short tends to become sod-bound and unpalatable. Where this has occurred an appropriate treatment is to tear up the sod in the autumn and sow perennial rye, subterranean and white clover. These species should become well established before the paspalum begins active growth again in the springtime and the combination of both winter and summer growing species will greatly enhance the grazing capacity of the pasture.

Regular top-dressing with superphosphate is, however, essential in the maintenance of such a

A good pasture of rye grass, white and subterranean clover developed on Mr. Davies' property at Yanakie. Note contrast with unimproved scrub land on this side of the fence.

pasture mixture, otherwise it will rapidly become sod-bound paspalum again. Drainage and perhaps liming might be advantageous in such circumstances.

Should the growth of the paspalum pasture get out of hand during the late summer, mowing is beneficial to promote fresh leafy growth and allow the more lowly species access to sunlight.

Improved pastures cannot develop satisfactorily if rabbits are not kept in check. These pests overgraze the pasture species causing them to die, and in consequence the sward becomes open and weeds become established. Pasture swards may also become open and weedy following the activities of grass grubs. In fertile soils thistles are the commonest invaders. In Gippsland, both the cockchafer and the so-called Tasmanian grass grub are common. The former is the larval stage of a beetle of which there are several species, and some are worst on the higher, drier parts of the paddock that are heavily manured by stock.

A near view of the improved pasture illustrated on the opposite page.

The use of pasture harrows can to some extent reduce the damage from cockchafer by disturbing dung pats and exposing beetle eggs and larvae, but once the grubs begin working underground it appears to be necessary to plough the land to exercise any control on their activities.

When sowing down country subject to bad attacks by cockchafer grubs it is a good plan to include some paspalum in the mixture to assist in keeping the sward closed, as this grass is less readily attacked than rye grass and cocksfoot. An alternative would be to sow phalaris and subterranean clover and introduce rye grass from time to time with surface sowing.

In contrast with the cockchafer, the Tasmanian grass grub is most common on the wetter soils where there has been good cover during the summer and early autumn. The adult form of this pest is a moth that apparently seeks cover when laying its eggs. Conservation of surplus spring growth is suggested as a means of reducing the incidence of this pest. This is also very essential as a means of providing feed for stock during lean periods.

One of the major problems in grassland farming in Gippsland is the meagre growth of pasture that occurs during the winter months. If adequate reserves of fodder are not available, this inevitably leads to over-grazing. Under such conditions the good perennial grasses are replaced by "flat weeds," fog grass and other low-grade species.

Conservation of pasture herbage either as hay or silage and the growing of fodder crops such as oats, rye, or roots for the winter time is a satisfactory means of supplementing pasture growth during June, July, and August.

Paddocks that have deteriorated and need resowing would be the appropriate ones to break up and use, keeping in mind, however, that if the fertility of the soil is already poor, the removal of fodder will make it worse. Best results, therefore, will follow if it is eaten in the paddock where it is grown or else the animal excreta should be returned in the form of liquid manure. Night paddocks would be very suitable for the growing of fodder that is to be carted away and fed elsewhere.

After the land has grown one or two fodder crops and weeds have been eradicated, it could be sown down and other paddocks selected for breaking up. In such a manner, the poorest paddocks on the farm can be regularly broken up and resown while at the same time winter fodder is being grown.

For autumn fodders, maize and millet are useful supplements to feed with concentrates and a paddock of lucerne or red clover (cow grass) is

Strawberry clover makes good pasturage on low-lying areas in the Western District.

invaluable for providing protein rich fodder for feeding with the more bulky supplementary foods.

Pasture Improvement in the Western District

Most of the sheep country in the Western District can be readily improved by surface-sowing pasture seed and superphosphate on the native grass sward or with a cereal cover crop after cultivation. In the southern part where conditions more closely approximate to those of Gippsland, and the land is timbered, ring-barking the large trees and sowing on the ash with or without preliminary cultivation is the usual method employed.

On the open plains country that ordinarily carries about three dry sheep to 4 acres, a method of top sowing that gives good results is to work in with a "combine" a mixture of 3 to 5 lb. of perennial rye grass with 3 lb. of subterranean clover and 1 cwt. of "super." immediately after good rains in the autumn and this may be continued until heavy frosts occur. Seed cover is assisted by dragging a heavy chain or similar contrivance behind the "combine".

Unimproved land can thus be transformed into country that will carry about five sheep to 2 acres. With a nineteen hoe "combine" sowing down might reasonably proceed at the rate of about 350 acres annually.

For the first year, the rate of stocking should be reduced to about half of normal. The critical period is when the subterranean clover is seeding itself down and stocking must be carefully regulated to permit this to take place. Complete protection from stock during the seeding year, however, may be disadvantageous in a normal season as rank growth of subterranean clover is not conducive to the plant burying its seed.

A light seeding of oats may or may not be introduced with the surface-sown pasture seed, but in any case, some additional cultivation to produce a reserve of fodder to offset the loss of grazing is an essential part of the scheme, as also is the regular use of superphosphate, in common with pasture improvement practices in other parts of the State.

On the lighter soils which dry out during the summertime and where perennial rye grass does not persist a more suitable permanent grass is phalaris tuberosa, which can sometimes be introduced by surface sowing 2 lb./ac. with subterranean clover. A more certain method of introduction is to sow the mixture of phalaris and subterranean clover after cultivation on fallowed ground or on crop stubble in which case 1 to 2 lb. seed per acre should be sufficient.

"Phalaris" is sensitive to competition during the seeding year, and it is usually unsatisfactory to sow it with such plants as oats or rye grass. Results from surface sowing "phalaris" in sub.-clover paddocks are uncertain and it is desirable to reduce the competitive effect of the clover by cropping for a few years and then to sow the "phalaris" on the stubble, or, where the spring rainfall is reliable to work the subterranean clover paddock about August and introduce the "phalaris" by sowing in the early spring.

Lucerne can be a useful adjunct to improved pasturage in the Western District and annual yields of 4 ton/ac. of good quality mixed hay are not uncommon.

Throughout the Western District there is a considerable area of stoney country where the soil is good but pasture improvement is difficult. On this class of country the control of rabbits by netting and poisoning is an essential pre-requisite to pasture improvement, and the broadcasting of seed and fertilizer and feeding pasture

hay to stock on the land to be improved seems to be the most practical approach to the problem.

During the early years of establishment, improved pastures should be stocked very moderately and a small residue of dry feed left to serve as a protective autumn cover for young seedlings of subterranean clover.

Generally speaking, superphosphate gives the best returns for money spent on fertilizer in the Western District, and there is little evidence of the need for using lime in conjunction with it. The regular use of "super." supplies calcium in addition to phosphate and, therefore, does not introduce a need for using lime.

Progressive stages in pasture improvement at Heathmere.—(1) Virgin bush. (2) Pasture developing from seed sown on ash after a burn. (3) The established pasture consists of fog and rye grass, white subterranean clover and birdsfoot trefoil.

As the pastures improve and soil fertility builds up, conditions become ideal for the growth of high-fertility weeds, which if they can gain an entry into the pasture soon become the dominant species.

The worst offender is undoubtedly cape weed, and it usually comes into improved pastures after the perennial rye grass has become thinned out as a result of dry weather or attack by cockchafer grubs. In the former instance, the death of the rye grass may be only indirectly attributable to the dryness, and the prime cause often is the weakening of the plants by over-grazing and malnutrition.

Constant overgrazing during the winter has a weakening effect on perennial rye grass and is conducive to opening the sward and permitting the entry of cape weed. While pasture harrowing and the spreading of cow dung is a commendable practice, it is also a means of spreading cape weed

Combining "sub. and super." into red-gum country in the Western District.

seeds, and on open swards the spread of cape weed is encouraged by using heavy pasture harrows. Trials carried out in the Western District have shown that perennial grasses such as "paspalum," "phalaris" and kikuyu keep the sward reasonably well closed, and in consequence, much less cape weed develops where these grasses are prominent in the sward. In renovating pastures that have become infested with cape weed, early spring ploughing and the sowing of rape or kale would be an appropriate procedure and this could be followed by oats for grazing the next winter.

The spring ploughing would serve the dual purpose of preventing the cape weed from seeding and would disturb cockchafer grubs at a vulnerable period in their life cycle.

Paddocks subject to constant visitations by cockchafer grubs would probably best be sown down to "phalaris" and subterranean clover, while the addition of a little paspalum to rye grass/subterranean clover mixtures should safeguard the pasture against heavy cape weed invasion following an attack by grass grub.

In the southern part of the Western District, where dairying is the major pursuit, regulation of grazing is important to control weeds and maintain a good balance of grass and clover. Subdivision, adequate intervals between grazing to permit recovery of the better pasture plants and supplementary feeding are all important in pasture maintenance. The extremely rapid growth of herbage during the springtime provides an excellent opportunity to conserve hay or silage for feeding during the leaner periods and in conjunction with this, oats for winter grazing, rape, millet and maize in the better rainfall areas or kale in the drier parts for summer feed will provide a useful supplement to the pasture growth.

Paddocks that have deteriorated and are in need of renovation could be appropriately used for growing fodder crops for feeding off, after which they could be sown down. A long term rotation including one or two fodder crops and say eight years of pasture might prove to be a satisfactory system of field management on dairy farms in many parts of the Western District.

Because of the low status of potash in the soil in a large part of the southern Western District, pasture management on dairy farms should be carefully planned to avoid subjecting any one area to exhaustive treatment. The use of farmyard manure is strongly advocated as a means of counteracting the heavy drain on soil fertility that occurs under dairy farming. Every ton of concentrates purchased for cows has a considerable fertilizing value, and for this reason alone attention to the collection of farmyard manure would be well repaid.

Pasture Improvement in the Central District

Throughout the Central District there is a wide range of soil and climate, but generally most parts offer great possibilities for pasture improvement.

On some of the plains in the western part and in the light hill country to the north of Melbourne insufficient soil moisture during the autumn and springtime is often a limiting factor, while in the highlands the long cold winter conditions are inimical to the development of pasture seedlings. All soils suffer from a marked deficiency of phosphate.

While the last of these difficulties can be readily overcome by top-dressing with superphosphate the other factors render it necessary to practice more skill in introducing improved pasture plants in many parts of the Central District than when sowing in other more favoured parts of the State.

On the western plains where the soil dries out thoroughly during the summer time, perennial rye grass is often short-lived and phalaris tuberosa is a better grass to sow for a permanent pasture. Generally the "Bacchus Marsh" variety of subterranean clover is the most suitable one to sow with it.

Where land has been cropped with cereals an appropriate procedure would be to sow the subterranean clover with the last crop and top sow the "phalaris" into the stubble the following autumn. One could "combine" both grass and clover seed into the stubble, but the introduction of the clover twelve months beforehand has the advantage of permitting it to build up soil nitrogen and make conditions more suitable for the subsequent development of the grass seedlings. It is not a good practice to sow "phalaris" with the crop.

On the better soils in the northern and southern parts of the Central District, perennial rye grass will persist if regularly top-dressed with superphosphate. Sowing on fallowed ground a mixture of 5 lb. of perennial rye grass and 3 lb. of "Bacchus Marsh" subterranean clover with 1 cwt. superphosphate under a cover crop of oats or on stubble ground, will give the most dependable results but where large areas have to be covered a faster method is desirable. In a good season, the method of top-sowing seed and fertilizer directly into the native grass sward should be satisfactory.

Lucerne will grow well in a number of places in the Central District; for example, on the red soils in the Melton-Rockbank area, and the alluvial soils in the Bacchus Marsh and Werribee districts. This perennial legume is very persistent and will withstand severe dryness. Irrigation is not essential for lucerne.

To ensure good results, lucerne should be sown on clean fallowed ground, as early in the autumn or spring as weather conditions will permit. Pea mite, lucerne flea, and frost are the worst enemies of young lucerne. A light dressing of lime applied to the ground about a month before sowing the lucerne is said to be beneficial and is recommended for trial when sowing lucerne. The life of the lucerne stand will depend largely on the management it gets. Close continuous grazing is very weakening and the best treatment is to allow intervals for recovery between defoliations. It should not be grazed close enough to damage the young shoots.

On the soils derived from silurian rock in the Kilmore area, lime has given good results when applied to pastures established by cultivation, and somewhat similar although less spectacular results have been obtained on soils of similar geological origin in the Lilydale district. Various brands and forms of lime have been tried and all have given positive results.

At Woodend on the grey soils where "twitch grass" is firmly established, a marked improvement can be effected by close grazing, liberal top dressing with superphosphate and the introduction of subterranean clover and perennial rye grass. Fallowing and summer cultivation however is necessary to entirely eradicate the "twitch grass".

Some of the light grey soils in the Central District have limited reserves of potash which is readily exhausted if the soil is subjected to exhaustive treatment. The most striking evidence of this has been obtained from top-dressing trials at Yering and Seville. There is some evidence to suggest that a deficiency of a minor element may be a limiting factor to pasture development on these lighter grey soils of silurian origin.

In the eastern part of the Central District where generally the rainfall is better, cocksfoot and paspalum could be sown with perennial rye grass in the pasture mixtures with advantage

Subterranean clover developing in a native grass pasture after sowing with a combine.

and the subterranean clover sown could appropriately be a mixture of "Mt. Barker," "Bacchus Marsh" and "Tallarook" with the purpose of giving continuity of growth. Dairy farmers in this part of the State need to take the usual precautions to conserve fodder for feeding during the lean periods of the year and the usual practice is to cut the surplus spring pasture growth for silage or hay. In addition to this, supplementary fodder crops such as rape, millet, maize, oats for winter grazing and root crops would ensure adequate food for dairy stock the whole year round. In the areas of restricted rainfall oats are much more certain than any of the other supplementary crops mentioned.

On the higher country throughout the central highlands where the winter is longer and more severe and the period of active pasture growth shorter, greater emphasis needs to be given to supplementing pasture grazing with conserved fodder and the growing of fodder crops. Farmers who neglect this aspect of farm management place too much stress on the pasture during its periods of dormancy and the result is a weakened sward that becomes invaded by weeds. Rye corn is attracting attention as a winter grazing crop for cold districts.

Paddocks selected for the growing of root crops, kale and the like, should be subsequently sown down to pasture and not left to come back into grass naturally, as this is a relatively slow process and an inferior weedy type of pasture usually develops.

In contrast to the severe winter conditions that prevail in the central highlands, the climate on the Mornington and Bellarine peninsulas is relatively mild and pasture growth on even the lighter soils with limited rainfall is surprisingly good. Generally, perennial rye grass and subterranean clover are the species suited to these areas and some of the heavier soils on the lower levels carry good strawberry clover in addition. The use of superphosphate is essential to pasture development in the Central district.

Pasture Improvement in the North-Eastern District

The area of improved pasturage in the north-eastern division of the State is relatively small and there is great scope for pasture improvement when superphosphate becomes more readily available.

Up to the present time most of the improvement that has taken place has been brought about by means of "sub. and super.", and although this has effected a considerable increase in carrying capacity, it represents only part of what may be achieved.

While subterranean clover can be readily introduced, and if the appropriate variety is used, will soon build up a vigorous "permanent" pasture, the problem of developing a mixed pasture that includes a satisfactory perennial grass is more difficult.

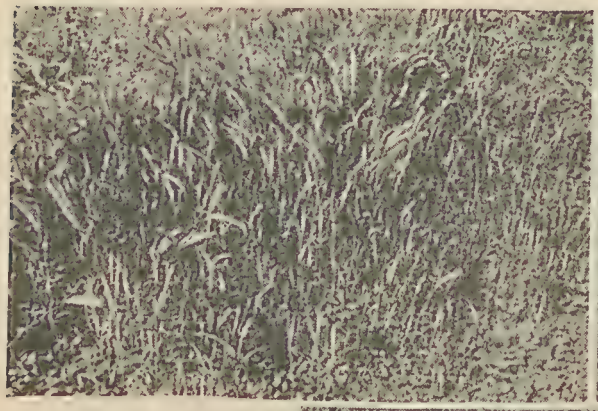
Where the annual rainfall exceeds 25 inches and the soils are not of too light a texture or have not a dry northerly aspect the "mid-season" (Mt. Barker) variety is the one recommended for general sowing while in the better favoured areas some "Tallarook" (late-flowering variety) can be introduced with advantage. This strain is less productive during the winter time than the mid-season one but makes its flush growth later and remains green longer than "Mt. Barker".

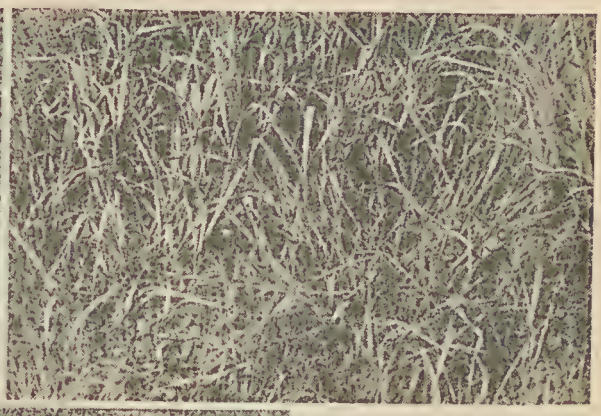
On the light hill country with a northerly aspect the "Bacchus Marsh" variety of subterranean clover is more certain to persist, as it matures earlier than the mid-season one. This ensures seed setting before conditions become too hot and dry.

To the west of the Hume Highway on the lower rainfall country the sowing of a mixture of "Bacchus Marsh" and "Dwalganup"

Improved pasture of perennial rye grass and subterranean clover on Mr. R. Graves' property at Mansfield.

Left—Barley grass luxuriating in a subterranean clover pasture in the absence of competition from a perennial grass. Lower—Cape weed and goose grass invade improved pastures at Wangaratta. Right—Phalaris tuberosa grows well with subterranean clover and restricts development of annual grasses and weeds.





varieties would ensure persistence of the subterranean clover.

Generally speaking, with the exception of the deeper loams in the river valleys, the north-eastern part of Victoria is unsuited to permanent paddocks of perennial rye grass when sheep are the grazing animals. Although the rye grass grows quite well for the first two or three years, even to the extent of suppressing the development of subterranean clover, subsequently it thins out and the pasture becomes invaded by annual species of grass, principally soft brome and barley grass.

On the deep alluvial soils, however, where perennial rye grass will hold, a seeding of 3 to 5 lb. with 3 lb. per acre of subterranean clover is the recommendation. Even in the better favoured areas, perennial rye grass sometimes has a struggle to persist during the summer. Lenient grazing assists plants to withstand dryness because it encourages the development of a strong root system.

Although soils on most of the rising country in the north-east will not hold perennial rye grass, phalaris tuberosa will persist quite well if given adequate top-dressing and is properly grazed.

A pasture consisting of "phalaris" and subterranean clover is more suitable from the nutritional point of view than one of subterranean clover and annual grasses. Such annual species give little grazing in the early autumn and in the springtime soon become fibrous and unpalatable. Once "phalaris" becomes established, it is very tenacious and unless treated exceptionally harshly, can be regarded as a permanent element in the pasture. It is however very sensitive to competition during the year of sowing and farmers sometimes have difficulty in getting a satisfactory pasture of "phalaris" on this account. In the north-east, a trial at Wangaratta has shown that it can be readily established by sowing on well prepared fallowed ground as little as 1 lb. per acre with superphosphate, but on no account should it be sown with perennial rye grass as this suppresses its development to a marked degree. Perennial rye grass will however often develop spontaneously if the "phalaris" has been sown in a suitable environment such as the Kiewa Valley.

Paddocks that have been cropped a few times with cereals might appropriately be sown down to "phalaris" and subterranean clover by introducing the clover with the last crop and "combining" the "phalaris" into the stubble in the autumn. Should it be desired to introduce "phalaris" into paddocks where subterranean clover has already become strongly established the safest method is to cultivate and take off a few crops and then either sow on fallow or "combine" seed and superphosphate

[*Continued on page 30.*

ANTHRAX

By G. NICOL, B.V.Sc., Veterinary Officer

ANTHRAX is an acute infectious disease of man and animals. Cattle and sheep are the most susceptible of the domesticated animals, but cases have been reported from time to time in other stock. Man also can be affected.

The cause of the disease is an organism known as *Bacillus anthracis*, which has the ability to form spores which are able to persist for long periods in the soil. When these spores are swallowed or enter a wound with contaminated soil or other material, they rapidly change from their spore form of life to another form which multiplies rapidly so that in a short space of time the blood stream is invaded and the body's resistance overwhelmed.

Usually when an outbreak first occurs no symptoms prior to death are noted. The owner or district Stock Inspector reports mortality in stock with a history of rapid deaths, carcasses showing dark blood about the mouth, nose or other body openings. Diagnosis is established by examination of the blood microscopically and confirmed by inoculation of guinea pigs. Where an outbreak has been established, some cases may be noted which show symptoms of restlessness, laboured breathing, cessation of milk secretion, alteration in appearance of the visible membranes such as those of the eyes, nose and mouth, with excitement in some cases which may change to lethargy and depression.

A word of warning is here necessary. Anthrax is a notifiable disease in Victoria and any suspicious cases should be reported to the district Stock Inspector. In no circumstances should a post-mortem examination be conducted, as the risk of infection to the operator from blood or other parts of the carcass is great. If it is not possible to obtain a Stock Inspector's assistance and a diagnosis is desired, an ear should be cut off at the base, placed in a tin with a press-in lid which should be soldered at three points (that is, not completely soldered) and labelled clearly "Suspicious of Anthrax". Place this tin in another container such as a cardboard box well padded with an absorbent material, and forward by registered post to the Director, Veterinary Research Institute, Parkville, N.2. In addition, advice of despatch by telegram or telephone should be made.

The reason for sealing the tin in such a way is because of danger to laboratory personnel, and resort should not have to be made to tin cutters with associated risk of serious accidents. One should also bear in mind in taking the specimen that the blood is a very real source of infection, and occasionally also the skin of an infected animal, so that every possible care should be taken, not only in the taking of the specimen, but in one's subsequent personal hygiene.

Disposal of the carcass also presents a problem which should not be taken lightly. A carcass, which has by some misfortune been opened, liberates bacilli which in turn revert to the spore form, so that unless every precaution is taken, a source of infection for years to come is immediately propagated, in the form of viable but extremely resistant spores. Where possible the carcass and associated discharges should be burnt on the spot. If this is not possible, a conveniently large pit should be dug and the carcass burnt in it. Make sure that the surface soil where the carcass lay is also removed to a depth of several inches and then sprayed with a 10 per cent. lysol solution.

Records of the Department of Agriculture indicate that a number of outbreaks have occurred in Victoria over the past few years. As an uncontrolled outbreak would be a major disaster in any State, it is worth mentioning that the methods of control successfully employed have been the imposition of quarantine restrictions on affected properties, the vaccination of sheep and cattle on these properties and adequate disposal of carcasses. Partly on economic grounds, and partly because of the natural resistance of certain stock, the position relative to vaccination of other stock such as horses, pigs and dogs is a variable one; one point of interest is that horses often react severely to vaccination, so that dosage and after-care become particularly important where vaccination of horses is undertaken.

Particular care must also be exercised in the handling of the vaccine and the manufacturers will issue this product to qualified Veterinary Surgeons only. It is fortunate, however, that the disease is often more slowly progressive in humans than in animals, so that modern methods of treatment which now include the use of penicillin, give prospects of a more favourable prognosis than in the case of animals.

PIGS

Salvage Unit of Food Industries

By L. A. DOWNEY, H.D.A., Pig Expert

PIGS serve mankind best as salvagers of waste, refuse, by-products and surpluses which occur in the production, processing and consumption of many kinds of human foods. As salvagers there should be a few pigs on every farm, but only a few pig farms such as those using by-products as waste from food factories.

There appeared in this Journal in November, 1943, an article suggesting that the pig industry should be kept in its proper perspective during that period when unusual conditions were affecting the industry. At that time, Australia had a surplus of wheat and a scarcity of pig meat and action was taken to encourage the conversion of increasing quantities of wheat to pig meat. The article referred to was designed to encourage that conversion of wheat to pig meat but it also stressed that there would not always be a surplus of wheat which could be supplied to pig producers at a concession, and that pig raising should be developed on the basis of a few pigs on every farm to salvage waste and by-products occurring there.

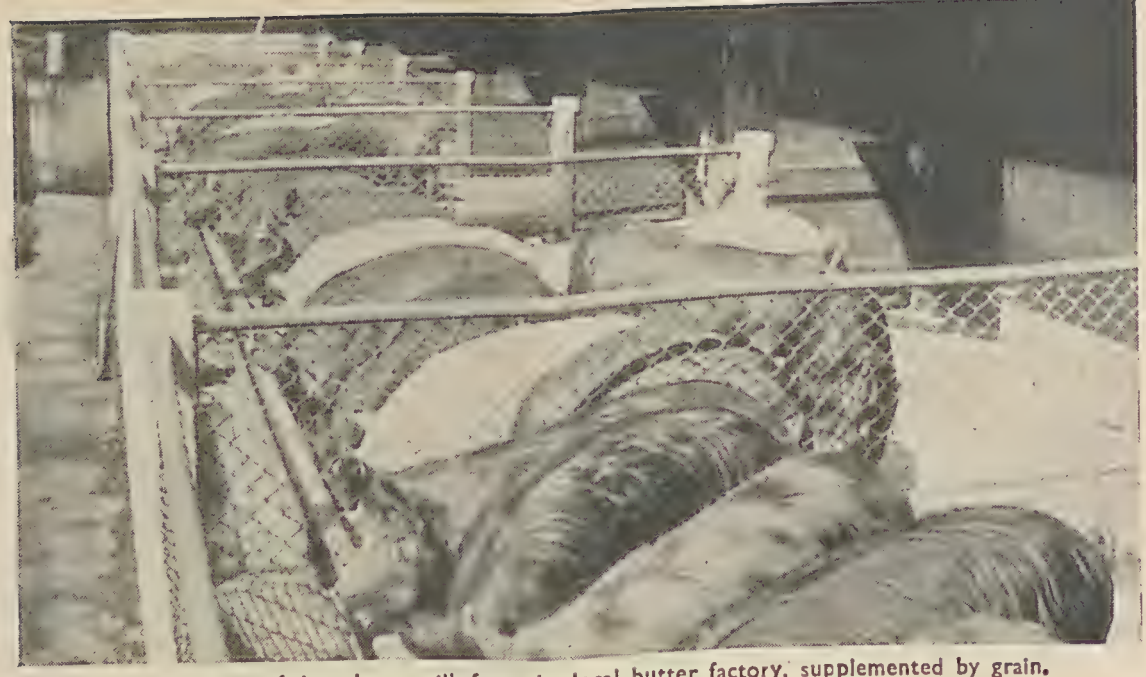
Since publication of the article mentioned, there have been changes in the pig industry. For that reason and because many men leaving the defence services contemplate engaging in pig production, it is considered appropriate now to draw attention to some of the basic features of economic pig production. The food supply should be the starting point in any pig meat production plan, the pigs being only the means of converting the food to meat.

Because pigs are kept for profit, their foods must be considered more for their economic value, that is, the net profit to be derived from converting them to pork, than for their biological value, that is, their effect on the quantity or quality of the pig meat they yield.

Pigs are essentially producers of meat and as such, must compete with cattle and sheep, but they do so under a handicap because cattle and sheep feed mostly on cheaply produced bulky foods, such as pasture, which have only a limited place in the diet of modern pigs selected for their inherent capacity for rapid growth and reproduction.

The rapid growth and reproduction of pigs is often used as an argument in their favour but, because those characteristics demand a concentrated diet, they can be a handicap unless the right kind of foods can be obtained at a cost favorably related to pig meat values. Another point worth noting in this comparison is that pigs do not yield a wool clip nor is there a cash return for their milk.

Among the salvage jobs done by pigs are the conversion to meat of separated milk on farms from which cream is sold, butter-milk and whey from dairy produce factories, kitchen refuse from eating establishments, unmarketable fruit and vegetables from farms and markets and by-products and surpluses from the grain industries. All of those foods are the kinds used by humans and, because it requires about 6 lb. of such foods



These pigs are fed on buttermilk from the local butter factory, supplemented by grain.

on a dry meal equivalent basis to produce 1 lb. of pig meat, the pig industry can generally afford to use only the portions of such foods remaining after human requirements have been satisfied.

Separated milk is probably the greatest single food used in the diet of pigs in Australia and, in the absence of a better market, it is fed to pigs at almost any price. About 6 gallons of separated milk are used to produce 1 lb. of pig carcass under average Australian conditions, and from the gross value of that carcass there must be deducted the cost of items other than food involved in its production and marketing, leaving a net return of only about 1d. per gallon.

While pigs are a necessary convenience on dairy farms from which cream is sold there is a fairly constant supply of pigs from that source, but that supply may be increased by supplementing the separated milk with any other suitable foods which are available at a cost bearing a favourable relationship to pig values.

Grain is the most commonly used food for this purpose and the extent of its use depends mainly on the pig : grain price ratio.

Variations in this ratio are the chief cause of fluctuations in pig production. The pig : grain price ratio concerns not only the dairy-farming pig-raisers but other pig-raisers too.

When the ratio is greatly in favour of pig production a few people venture into pig raising as a separate industry. They feed pigs on a diet comprised mainly of grain to which the necessary protein, mineral and vitamin supplements are added. Such enterprises are precarious and in the past many have failed because, in addition to the usual hazards of pig farming, they have depended on a grain surplus to provide a pig : grain price ratio even more favorable than that required by pig-raisers whose enterprise is based on less expensive salvaged waste and by-products.

Another disability of this kind of specialized pig farming is the relatively large amount of capital required to purchase foods, and this is often under-estimated by people embarking on the enterprise. A pig : grain price ratio favorable to pig production also brings some grain farmers into the pig industry. In deciding whether to sell their grain in bags or in pigs, the grain growers have to consider the additional time required to realize on their grain, and the equipment, stock and skilled labour required for pig raising. These factors make grain farmers hesitant about pig raising even when it would be profitable to them.

The best plan for such farmers is to breed pigs at all times as an integral part of their farming, keeping a constant number of breeding sows, and varying their production by marketing the progeny of those sows at lighter or heavier weights, as the pig : grain price ratio dictates. As is the case with dairying pig-raisers this plan is more satisfactory than drastically reducing or increasing the number of breeding sows as conditions in the industry change. It is also preferable to the

practice of buying store pigs when the pig business looks good, because usually it is not possible to buy the number and quality of stores required.

A few apple and pear growers and market gardeners keep pigs and generally find them profitable, because when limited numbers are kept a substantial part of their diet is obtained from unmarketable produce of the property, thus enabling the purchase of supplementary foods to complete a good and economical diet. These pig raisers place a high value on pig manure which they are able to cash through their fruit or vegetable crops.

Pig raisers have to decide when the pig : grain price ratio is favorable to them, and each case must be considered individually, taking into consideration the average sale price of pigs, the cost of foods other than grain in the diet, and the cost of labour for seven days a week and some nights, interest on capital outlay, depreciation on equipment, rent and other overhead costs in raising and marketing the pigs.

In calculating grain prices they should include delivery to the piggery and crushing ready for feeding.

It requires, under fair conditions over a herd of pigs, approximately the equivalent of 7½ cwt. of meals to produce a 200 lb. live-weight bacon pig (140 lb. carcass weight) from its conception, that is 6 lb. of meal-equivalent for 1 lb. of carcass.

In all kinds of pig farming the provision of pasture and other cheaply produced forage crops is desirable, mainly because they are a source of food accessories which are deficient in some of the common pig foods, and partly because they may reduce the total cost of the diet, but these bulky foods have only a limited use in this respect for pigs with the inherent capacity for rapid growth and reproduction. Also, it must be considered whether the land and effort required to grow pig fodder would not return a greater profit if used for crops more valuable for other purposes.

Obituary.

MR. J. T. THYNNE

We regret to announce the death on 1st December of Mr. John T. Thynne, Private Secretary to the Minister of Agriculture. Mr. Thynne, who was 56 years of age, had been private secretary to 25 State Ministers of Agriculture. His first appointment was in 1912 as private secretary to Mr. George Graham, Minister of Agriculture in the Watt Government, and except for the period he was away in the First World War, he had served every Minister of Agriculture since. Before he joined the first A.I.F., Mr. Thynne acted as official recorder for the Australian Wheat Board, over which the Prime Minister, Mr. W. M. Hughes, presided. Mr. Thynne is survived by his widow and two sons, John (A.I.F.) and Alan.

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Feeding Ryecorn Hay and Grain to Stock

A NUMBER of enquiries has been received by the Department concerning the value of ryecorn for stock when fed as hay or grain. Interest in this aspect of stock feeding has probably been aroused as a result of the increased area of land being sown with this cereal crop for winter grazing and as a means of drift control, particularly in the Mallee.

Although ryecorn grows well on good soils, certain characteristics render it less valuable as a fodder crop, except for grazing, than other cereals such as oats or wheat. Its cultivation throughout the world has, therefore, been limited to areas where climatic or soil conditions are unfavourable for the cultivation of better types of fodder crops.

The usefulness of ryecorn as a winter grazing crop in the Mallee was discussed in an article published in this Journal for April, 1944. The stems of mature ryecorn hay, however, are coarse and fibrous and the grain yield of the crop is unsatisfactory. For feeding to live stock, ryecorn is, therefore, recommended mainly as a green forage crop, and only in districts where it is capable of providing more green fodder than other cereals.

The number of farmers who may have ryecorn hay or grain to feed to their stock will be very limited but the following information, compiled mainly from the experience of live stock owners in other countries, may be of interest.

The best quality ryecorn hay is obtained when the crop is cut at the flowering stage before the stems become too harsh and woody. Its food value in such a condition is roughly equal to wheaten hay which has been cut at the same stage of growth and it can be fed safely on its own or mixed with other roughages. Ryecorn straw is seldom used as a foodstuff, but it is particularly good for thatching or for manufacture into bottle envelopes. It is also suitable for litter or bedding for stock.

The food value of ryecorn grain is roughly equal to that of wheat or barley but when fed in large quantities it is less palatable. However, any disadvantages can be overcome by mixing the grain with better liked concentrates, so that it forms only a portion of the concentrate mixture. Sheep appear to like the grain better than horses, cows, or pigs, and they can be fed with it on its own. Except for sheep, the grain should be crushed or ground to a fine but still gritty texture.

[J. T. KELLY, B.Agr.Sc., Science Field Officer.]

Feeding the Stallion

From the nutritional aspect, stallions require attention very little different from ordinary horses and it is not necessary to add to the cost of their upkeep by purchasing expensive concentrates. The main consideration is to keep the stallion in good but not too fat condition, and this is achieved by adjustment of the ration according to loss or gain in condition.

With good quality cereal hay or chaff and green feed providing the bulk of the ration, health and condition should be maintained with oats as the only concentrate. Lucerne hay or chaff, however, can be used with advantage to replace a portion of the cereal hay or chaff, and bran can be used to replace some of the oats. Bran is valuable because of its mild laxative properties, particularly if insufficient green feed is available. 1½ lb. of bran is equivalent in food value to 1 lb. of oats.

The quantity of feed eaten by horses varies according to their size and the amount of work they perform, so that stallions obtaining an adequate amount of exercise could probably be compared with horses doing light work. On this basis a light stallion of 1000 lb. live weight would require the equivalent of about 22 lb. of good quality chaff per day. This amount of chaff could be fed or the ration could be given as 15 lb. of chaff and 5 lb. of oats. Heavier stallions require proportionately more nutrients, but they cannot satisfy the demands of their bodies on such a bulky foodstuff as chaff alone. The proportion of concentrates in the ration is, therefore, increased so as to keep the quantity of the fodder within the range of the animal's appetite. The needs of a 1500 lb. stallion would probably be met by 20 lb. of chaff and 7 lb. of oats. Particularly heavy draught stallions exceed 2000 lb. in live weight.

Pasture is a most valuable and cheap type of fodder for stallions and where no grazing is available an ample supply of greenstuff should be fed daily. This can displace a portion of the chaff in the ration, 4 lb. of greenstuff being equivalent in food value to 1 lb. of chaff.

It is important for stallions to receive plenty of exercise and this can best be given by working them on the farm like any other horse. If this is not possible a roomy paddock should be provided.

Highest fertility is usually noticed with stallions which are heavily exercised or regularly worked, which receive plenty of green feed and are given sufficient dry feed (chaff, oats and a small amount of bran) to keep them in good but perhaps not show condition. However, as showing is often desirable for publicity purposes it may be necessary to keep them in show condition.

[J. T. Kelly B.Agr.Sc., Science Field Officer.]

Merinos in America

Over 100 Australian Merino sheep which have been exported to the United States of America are being used in various breeding experiments under the supervision of J. F. Wilson, Wool Specialist, University of California. The Australian Merino is being crossed with the Rambouillet and this cross is expected to find an important place in the wool production of the Western States of America. It is hoped to combine the larger body and better conformation of the Rambouillet with the much better fleece of the Merino.

Among the rough conditions found along the north coast of California, the Merinos have produced an average of 1½ to 2 lb. more greasy wool and 50 per cent. more scoured wool than the local popular wool-producing breeds during the last four years. This report speaks well for the Australian Merino and the quality of the animals exported.

Drinking Water for Pigs

Drinking water, clean and always available, is just as important as food to pigs, excepting of course, those pigs which receive large quantities of milk in their daily diet.

An insufficient water supply will restrict the growth of young pigs and the milk yield of brood sows, as much as an inadequate supply of food will.

Pigs using self-feeders will make frequent journeys to the water trough and if they do not get enough to drink they cannot eat as much as they desire.

There are many ways of providing drinking water for pigs. The automatic systems which have water piped to the troughs are generally more satisfactory than carrying water in buckets, but even these automatic systems must be inspected daily to ensure that they are functioning properly.

The consumption of water per pig varies, but as a guide in estimating their requirements, it can be assumed that pigs on dry food will drink about an average of 1 gallon daily for each 100 lb. of their live weight, but young pigs drink more per 100 lb. than do older fattening pigs.

Under most conditions, pigs waste more water than they drink by spilling it from the troughs. There are many devices for reducing that waste, such as the covering of the trough except for a place just large enough for the pig's head; setting the trough about 18 inches above the ground and

providing a step on which the pig can place its front feet while drinking; making the trough 2 ft. deep so that pigs cannot stand in it; and the provision of "push and take" fountains.

Although pigs like wallowing in mud during hot weather, they prefer clean water to drink and their drinking is probably restricted if the water is polluted. Water is cheaper than food for pigs so don't let it be the factor limiting their growth. Check the pigs' water supply now and during the rest of the summer.

[L. A. Downey, H.D.A., Pig Expert.]

Mineral Requirements for Poultry

The mineral requirement of a poultry ration is important because the body of the bird contains an appreciable amount which is continually being replaced, and a comparatively large amount is needed for shell formation in order that the birds may lay a high average number of eggs.

The lack of sufficient mineral matter in a ration, also certain vitamins, unfavourably affects the health of the birds, resulting in poor bone formation, improper functioning of the body, and laying soft-shelled eggs. With the usual feeds available, the only minerals that it is necessary to add are common salt and shell grit for calcium carbonate.

Properly balanced rations containing protein supplements, with the addition of adequate amounts of a variety of well-grown and tender green foods, supply a greater portion of the mineral requirements than inferior rations. It is, however, always necessary to provide the birds with additional amounts of common salt and shell grit. Reliable commercial mixed foods contain the necessary amounts of mineral, including common salt, but usually without shell grit.

When meat meal, which has a comparatively high bone content, is added to the feed, it is not necessary to add any bone meal to the ordinary ration, but for chickens up to 3 lb. of bone meal or 2 lb. of di-calcic phosphate may be included in 100 lb. of mash, weighed dry.

A certain quantity of common salt is considered absolutely necessary for poultry. This may be added to either the wet or dry mash in the proportion of ½ lb. to 1 lb. for adults, and ¼ lb. for chickens, for every 100 lb. of mash, weighed dry. These amounts should not be exceeded, and care should be taken to allow for any salt that is present in other ingredients of the ration. The fine salt used for stock purposes is suitable and cheaper than the household variety. The salt should be thoroughly mixed through the dry mash, and for the wet mash it should be properly dissolved in the liquid or soup with which the mash is to be made, to ensure an even distribution.

Shell grit, undoubtedly, is the most widely-fed form of mineral. Fine shell grit for chickens, and a larger form for adult fowls should be available at all times in hoppers specially provided for the purpose. It is important that the shell should be kept fresh and clean, as it is being continually consumed by the birds.

Charcoal has been commonly recommended for its supposed beneficial effects. Some poultry farmers of long experience say that they would not be without charcoal. Others again never use it now, and claim that they have never noticed any difference in the health of their birds since it was omitted from the rations. The very fact that birds eat charcoal freely has led to its use. In an experiment carried out with chickens fed on a diet capable of promoting normal growth and health, it was found, when 2 per cent. charcoal was included, the weight and growth rate of the chickens were seriously affected, probably on account of the fact that charcoal robbed them of essential vitamins. It was shown also that charcoal caused erosion of the gizzard lining. In addition, it is claimed that charcoal absorbs the yellow pigment of foods and prevents it entering the blood stream. This yellow pigment or carotin is really vitamin A, which is required by the birds for growth and disease resistance. As long ago as 1927, Holst and Newlon (Poultry Feeding: Principles and Practice, University of California) stated:—"Much investigational work has been carried out in order to demonstrate the benefit of charcoal feeding, but without success. It is certain that the absorbing power of charcoal has been over-emphasized. Even if present, the absorbing power would be of questionable value. Charcoal feeding for poultry should be given up as an unnecessary expense, just as it has been abandoned in human dietetics, where it was formerly recommended".

[H. F. Clinton, Poultry Expert.]

Beekeeping—Securing Good Combs

To secure perfect worker combs, it is necessary to see that the correct method of wiring is used. Four horizontal wires are not sufficient, an inverted V (Λ) wire from the centre of the top bar to the bottom corners of the frame being essential to prevent sagging. If starters instead of full sheets have to be resorted to at any time, they should be used only on swarms, for swarms will as a rule build worker comb until the first brood emerges.

Combs containing patches of drone cells may be repaired by cutting these patches out, and inserting in their place a piece of foundation of the required size and shape.

The hive should be set perfectly level on its stand as this is necessary to secure well-centred wires in a starter built comb.

Bees are apt to gnaw holes in foundation if it is left in the hive during a dearth of honey, when it cannot be drawn out.

In transporting wired foundation any distance, the frames should be securely fastened into the hives by nailing or wedging, and carried in an inverted position. If 3 or 4 inches of grass or straw are placed on the floor of the truck this, in conjunction with the above precaution, will prevent loss from breakage. Sprung wiring should be used on very rough roads.

Foundation should be drawn in the supers, and toughened up in the brood nest by a few hatchings of brood.

During the extracting rounds many new combs may be secured by dropping two or three frames of foundation into the strong colonies. This is good bee-keeping practice and the best method of eliminating poor combs which can be pressed into wax at the end of the season.

Combs off the bees should be stored in a dry place, made mouse proof, and treated against the ravages of wax moth by the use of bisulphide of carbon.

[W. A. Collins, Apiary Inspector.]

PULLORUM DISEASE OF POULTRY

Pullorum disease, known also as Bacillary White Diarrhoea is one of the most serious diseases affecting poultry. The trouble is responsible for extremely high mortality rates in young chickens, at times up to 90 per cent. Deaths from the disease may commence soon after hatching and continue for about 14 days. Frequently no symptoms are noticed, numbers of chickens being found dead. Others mope about, stand in a huddled position, show lassitude and at times a whitish diarrhoea. Some chickens recover and these recovered cases, being carriers of the causal organism, are a grave danger as they become the means of spreading the disease. Such birds may lay a proportion say 10 to 15 per cent. of eggs which are infected with the organism. If live chicks are hatched from any of these infected eggs, the fluff will be heavily contaminated with the infective organisms. The infection is rapidly spread as the fluff of the infected chicken dries in the incubator and particles of it are breathed into the lungs of other chickens. Infected chickens will also contaminate with their droppings, brooders and feed and water troughs, so that a new batch of chickens may become infected by being placed in a contaminated brooder.

There is no cure for the disease and it is too late to attempt control measures once deaths commence. The only satisfactory way to control the disease is to test all adult stock and remove all the reacting carrier birds before the breeding season commences. The testing of the breeding stock entails the submission of a blood sample from each individual bird to an agglutination test. This may be done by forwarding blood samples to the Veterinary Research Institute, Parkville, or the test may be carried out on the farm by a Veterinary Officer of the Department of Agriculture.

The Department conducts a Certified Pullorum-tested flock scheme, whereby poultry breeders may have their flocks tested to eliminate pullorum carriers. On the completion of the testing and the carrying out of certain necessary conditions regarding isolation and disposal of reacting birds, the flocks are certified and a list is published from time to time in this Journal.

Poultry farmers who desire to purchase chickens are strongly urged to obtain them from certified flocks, and those interested in having their own flocks certified as pullorum-tested should make application to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

[Contributed by the
Live Stock Division]

IN THE GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal,
School of Horticulture, Burnley Gardens

Seed Sowing

SEEDS which may be sown for the flower garden this month include—Anemone, Antirrhinum, Carnation, Mignonette, Pansy, Iceland Poppy, Ranunculus, Wallflower.

For the seed beds or seed boxes, choose a light sandy loam and mix with it a generous quantity of well-decayed manure. About one part of well-decayed manure to four or five parts of loam make a good seed compost. After digging the beds, or filling the boxes, the soil requires to be firmed either by heavy watering or by tramping. It is a mistake to have the soil in a seed bed too open and light because it tends to dry out too quickly and the seedlings tend to become weak.

Provide adequate drainage in seed boxes by covering holes in the bottoms of the boxes with cinders or crocks, and over this place a layer of old strawy manure or leaf mould. Seed beds and seed boxes should have level surfaces so that in watering the water tends to soak in rather than run off.

The actual method of sowing the seed will depend upon the preference of the gardener. Some gardeners broadcast their seed, while others prefer to sow it in shallow drills, spacing the drills about 6 inches apart. The latter method has the advantage that weeding can be more effectively carried out and there is less chance for the young seedlings to become overcrowded as they grow. Very fine seed should be mixed with about four or five times its own bulk of fine sand before attempting to sow it. This will assist the gardener to sow the seed thinly and avoid crowding and subsequent leggy plants which are difficult to transplant. Aim at growing a short, hardy seedling.

Seed sown at this time of the year should be provided with shade on hot sunny days. A light hessian covering which can be rolled up is perhaps the most convenient. After germination, give the young seedlings as much light as possible, but protect them from glaring hot sun by means of the hessian covering. In the early morning and in the evening, and on dull days, the covers can be left off so that the young plants receive more light. The seed beds and seed boxes should be watered by means of a fine rose, and watering should be sufficient to thoroughly soak the seed bed.

Other Garden Work

Dahlias—Young tender shoots of dahlia plants should be tied to the stakes frequently and a sharp lookout must be kept for red spider, which in dry hot weather multiplies very quickly on the undersides of the leaves. Another insect pest which can do quite a lot of damage when the young flower buds appear in the growing tips of dahlia plants is the larvae of the Light Brown Apple moth. This active green grub feeds on the developing buds and young leaves, causing holes in them. If they are very plentiful, it is advisable to spray the tips of the plants with arsenate of lead—1 oz. in 1 gallon of water, but most gardeners, while tying up their plants, look at the growing tips and if they observe any of them to be affected, just squeeze the young growth between their finger and thumb and so destroy the grub.

Gladiolus—When gladiolus plants are half grown, a light side-dressing of manure, either stable manure or fowl manure, will be found beneficial in producing a good flowering spike. This side dressing of manure should be applied to the soil beside the plants and lightly cultivated into the surface. Subsequent waterings will carry the plant food down to the feeding roots.

Chrysanthemums—Continue to pinch out the growth of chrysanthemum plants in order to make the plants bushy and keep them short. This stopping should take place when each growth is about 9 inches long, the growing tip is then pinched out and this causes a branching of growth below. Do not over water the chrysanthemum, otherwise the growth will become too rank.

Budding—Budding of roses and fruit trees can be done this month. It is necessary to have the stock in which the buds are to be inserted in a vigorous growing condition, in order that the bark may be lifted to facilitate the insertion of the bud. Water the stocks, or plants to be budded, thoroughly a week or a fortnight before the budding operation. Choose a dull day for budding in preference to a hot windy day. Th buds used should be plump and well developed and should be taken from mature wood. If all the budding is not completed on the first day a good plan is to bury the bud wood in cool moist soil until ready to complete the operation.

THE VEGETABLE GARDEN

Germination of Bean and Pea Seeds

Many enquiries have been received about the faulty germination of bean and pea seeds. Some of the factors contributing to this condition are the use of diseased seed or planting good seed in soil which carries disease from a previous crop. In some cases faulty germination is due to the use of old seed. This can usually be detected by soaking some of the seed in water for two or three days and examining the percentage of germination at the end of this period. More often, faulty germination is due to uneven and sometimes inadequate watering, or the seed may be sown at the wrong time of the year or at an incorrect depth. Some growers plant bean seed too early in the spring, while the ground is still cold. This crop is essentially a warm climate crop, and sowings made before September often show faulty germination and weakly seedlings if the seed does germinate.

Other causes for spaces in the rows of seedlings are depredations of birds and insects. Birds are particularly fond of pea seeds and sometimes after a successful germination they will pick off the young growing tips of the plants as they appear above the soil. Another possible cause of faulty germination is the use of too much chemical fertilizer, particularly if applied close to the seed. Some chemical fertilizers are very concentrated and also very soluble, and if used in excessive amounts can easily kill the germinating seed. Less frequently, injurious substances may be present in the soil.

Cabbages and Cauliflowers

Sow seed of *East Ham* and *Savoy* varieties of cabbages in seed-beds or seed-boxes and cover the seed to a depth of not more than half an inch. Seedlings from this sowing will be ready to plant out in March and April. *Phenomenal Maincrop* variety of cauliflower seed can be sown now and should be treated in the same way as the cabbage seed. The young seedlings of both these crops will require protection from the cabbage white butterfly. Dust with arsenate of lead dust, or spray with arsenate of lead—1 oz. in 1 gallon of water.

Brussel Sprouts and Broccoli

Seedlings of Brussel sprouts can be transplanted this month into well prepared beds. The soil should preferably be of a medium to a heavy clay type. The plants should be spaced 2 ft. 6 in. to 3 ft. apart. *Green Sprouting* broccoli plants can also be transplanted, spacing the plants about 2 ft. to 2 ft. 6 in. apart.

Lettuce

Sowings of summer and autumn lettuces, particularly variety *Imperial* 847, can be made this month. Cover the seed with half an inch of fine sandy soil.

Celery

Sow *Golden Plume, Export White* or *Golden Self Blanching* celery seed. Cover the seed with quarter of an inch of sandy soil.

Silver Beet

Another sowing of *Fordhook Giant* or *Dark Green Broad Ribbed* or *Lucullus* varieties of silver beet can be made now, to provide greens for the autumn and early winter. Better results are obtained at this time of the year if a few seeds are sown at distances of 1 foot apart in the rows. After the plants have germinated and grown to a height of about 1 inch or 2 inches they can be thinned out leaving one plant to every 1 foot in the row. Rows should be spaced about 2 ft. apart. Sow the seed ¾–1 inch deep and cover with a mixture of equal parts of well-decayed manure and sand.

Other Sowings

Other sowings which can be made include Dwarf French beans, including the butter or wax pods, carrots, red beet, turnip, kohl rabi and sweet corn.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Abrahams, L. J. ..	Red Hill South	Hawton, I. E. and F. ..	"Rossmoyne," Colac
Baker, J. J.	Bannockburn	Haywood, Dr. A. R. ..	Hastings
Beechy, K.	Pomborneit	Horn, L. A.	Leongatha North
Betts, V. R.	Craig's Lane, Pomborneit	Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Bidgood Bros.	Wodonga	Longerenong College ..	Dooen
Bodey, A. A.	"Bonnyview," Dooen	Mundy Bros.	Orbost
Bright, George H. ..	Dumbalk	Noble, T. M. and Sons ..	Maffra
Buller, R. A.	Beaconsfield	Northcote Children's Farm	Bacchus Marsh
Castle, L. H.	Clarinda	Petersen, E. V... ..	Korumburra
Coates, R. J. H. ..	Corangamite	Richards, Albert H. ..	Dumbalk, via Meeniyan
Cox, H. H.	Jacaranda Stud, Leopold	Rintoul, J. T. C. ..	Glengarry
Critten, H. S.	Dumbalk	Roy, W. A.	Morrell's Hill, via Boolarra
Devine, Herbert	Swan Marsh	Sexton, John	Swan Marsh
Dookie Agricultural College	Dookie	Simpson, Ronald D. ..	Birregurra
Doornbusch, John L. ..	"Starpark," Nhill	State Experiment Farm	Rutherglen
Dowie, Alexander ..	Mt. Moriac	Trenery and Sutherland ..	"Promview," Foster
Ellwood, A. H... ..	Paschendaele	Trigg, A. J.	Bungaree
Fairchild and Clutterbuck	Tinamba	Trigg, N. H.	Bullarook
Hamblin, A. T. and Sons	Toolleen	Tweddle, J. T.	"Winlaton," Shepparton
Hardinge, B. and Sons ..	Nar Nar Goon	Warry, A. and Sons ..	Delburn
Harris, Clement C. ..	"Egerton Villa," Loch	Whelpton, B.	Whittlesea North
Harrison, C. T... ..	"Eastside" Stud, Pomborneit	White, G. W.	Boolarra South

ERRATUM

In the Annual Herd Test Report published in this Journal for September, 1945, Mr. R. M. Chirnside's junior four-year-old cow "Mornmoot Princess Madeira 21st" was listed among the mature cows in error. This cow should have occupied second place on the list of Junior four-year-olds.

THE DUKE AND DUCHESS OF GLOUCESTER VISIT THE STATE RESEARCH FARM, WERRIBEE

The Minister of Agriculture, the Hon. W. G. McKenzie, M.L.A. introduces His Royal Highness to members of the State Cabinet.

The Royal Visitors discuss wheat breeding results with the Director of Agriculture, Mr. H. A. Mullett.

Outstanding performers of the Research Farm's Red Poll and Friesian dairy herds were inspected by the Duke and Duchess of Gloucester.

CHICK SEXING

Results of Examinations

By H. F. CLINTON, Poultry Expert

AN examination in chick sexing was conducted by the Department of Agriculture in October last, covering a period of nine days, to provide an opportunity for persons wishing to qualify for a Special, First Class or Second Class Government Chick Sexing Certificate.

Special, and First Class Certificates have been awarded to candidates from the commencement of the examinations in 1938, and Second Class Certificates were awarded for the first time in 1944.

It had been the intention to hold examinations annually, but it was found necessary to hold two examinations in each of the years 1943 and 1944.

Candidates for a Special Certificate are required to sex 300 White Leghorn chickens in 45 minutes, with an accuracy of 98 per cent., without killing or injuring a chicken. Those sitting for a First Class Certificate are required to sex 200 White Leghorn chickens in 30 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken, and for a Second Class Certificate 200 White Leghorn chickens in 50 minutes, with an accuracy of 95 per cent., without killing or injuring a chicken.

During the course of an examination candidates for a Special Certificate who are unsuccessful in qualifying for this certificate can qualify for either a First or a Second Class Certificate for the first 200 chickens sexed, provided that the conditions governing the respective classes are complied with. Similarly, candidates for a First Class Certificate can qualify for a Second Class Certificate, and, also, those sitting for a Second Class Certificate can qualify for a First Class Certificate.

Candidates are entitled to take the full time allowed for qualification, as completion of sexing in less than the prescribed time is unimportant for the purpose of these examinations.

Results

Forty-seven candidates presented themselves for examination—six for a Special Certificate, twelve for a First Class Certificate, and twenty-nine for a Second Class Certificate. Of the total number of forty-seven candidates, Messrs. A. T. Hewett and L. J. Smith qualified for a First Class Certificate, each having obtained an accuracy of 95 per cent., and their names have now been added to the list of qualified chick sexers. Another candidate qualified for a First Class Certificate, but had already received this certificate in a previous examination.

Difficulty in Learning to Sex.

Chick sexing is very difficult to learn, necessitating a high degree of technical proficiency only attained from a highly-qualified tutor, and considerable experience and practice with thousands of chickens is required before success can be achieved.

Of the total number of 208 candidates who have sat for examinations—some candidates sat for more than one examination—from the commencement to the present date, 1938–1945, two candidates have been awarded a Special Certificate, and six a First Class Certificate. A complete list of holders of chick sexing certificates issued by the Department is shown at the conclusion of this article.

Other Methods of Sexing

For many years attempts have been made to determine the sex of the future chicken in the egg, but up to the present it appears that no reliability can be placed on any of the methods suggested.

Investigators have concentrated also on an endeavour to find a practical method of distinguishing the sex of chickens at the time of hatching, and a high degree of success has been achieved by two methods which are now used commercially.

One method is known as sex-linkage, a term which implies the possibility of distinguishing the sex of day-old chicks, which are the result of the first crossing of two pure breeds, by their colour and in other ways. For example, if a Rhode Island Red male is mated to a light Sussex female, the male chicks will be white or

yellow, and the females a warm buff or brown. Quite a number of crosses may be made with different breeds. It is pointed out, however, that for accuracy of results much depends on the purity of the breeds used.

In one true-breeding race of fowls, the Cambar, there is no need to cross for the production of a sex-linked result. The Cambar is a light breed, developed by Professor Punnet of Cambridge University who, with Professor Bateson, was first in the field regarding the discovery of sex-linkage in poultry. In appearance, the Cambar much resembles a "Campine," and is, in fact, descended from Gold Campines crossed with Barred Rocks.

The main point in connexion with the Cambar is that it possesses the quality of sex-linkage within itself, no further crossing being necessary. Thus the male day-olds are of a pale grey shade striped with brown, while the females are much darker in their brown colouring, with only a few streaks of white or grey here and there. The Cambar was exhibited for the first time at the World's Poultry Congress at the Crystal Palace, in 1930.

Sex Linkage

Lower left: Female chickens following the colour of the male parent (Rhode Island Red) and lower right, male chickens following the colour of the female parent (Light Sussex). The two top birds are the parents and the two centre ones are the grown chickens.

Quite recently other varieties have been developed along similar lines, such as the Buffbar, Legbar, &c.

The White Leghorn, however, could not be used for sex-linkage purposes, except, perhaps, when crossed with some heavy breed—one a quick feathering and the other a slow feathering breed—and the sex of the chicks identified by the length or quickness of growth of the wing feathers, for fast and slow feathering, it is claimed, is sex-linked. It has been stated also, that it may be possible to establish two strains of White Leghorns, using the principle of quick and slow wing feathering as a basis, and the sex of the chickens distinguished at a day old. Some experimental work has been done along these lines recently with Australorps. The sex of White Leghorns cannot be determined unfailingly by any casual observation until the birds are about four to six weeks old.

The White Leghorn, which is kept in large numbers for egg production in many parts of the world, has not been used for sex-linked purposes, and a method of sexing day-old chicks of this variety, which has come into general use, and can be used also with any other breed, is by the presence, size, appearance or absence of a rudimentary organ on the ventral rim of the cloaca. As may be imagined, this method of sexing is a very delicate and skilled operation, requiring keen eyesight, and a suppleness and delicacy of touch not found in every individual. The details of the process take a long while to learn, and considerable practice is required before a high rate of speed and efficiency can be reached. This method was used by the candidates at the chick-sexing examinations conducted by the Department of Agriculture.

Many poultry farmers prefer to have the sexes separated at the time of hatching, as the cockerels then can be disposed of immediately, or kept by themselves, to be sold later for table purposes. The pullets are reared separately for the more profitable branch of egg production under ideal conditions necessary for their development.

It is pointed out that sexing day-old ducklings or goslings by means of the presence or absence of the male copulatory organ has not presented any difficulty at all, and the knowledge required for this purpose may be acquired quickly.

Mechanical Indicators

Quite a number of claims have been submitted to the Department from time to time, over a long period of years, that a means of determining

the sex of the future chicken in the egg had been discovered. In some cases the confidence and enthusiasm of the claimants were so marked, and appeals that the method should be given a trial were so earnest and persistent, that practical tests were actually made.

One of the first devices for determining the sex of the future chicken in the egg, that caused much excitement in the poultry world of Victoria, probably 40 years ago, was known under the various names of Sex Detector, Sex Indicator, Egg Indicator, Genderometer, &c. It is quite possible that thousands of these instruments have been sold throughout the world.

Many authorities have carried out tests with these detectors, and the results were not in accordance with the claims made for them. The writer has tested them on eggs known to be infertile, and also on boiled eggs. In all cases the apparatus moved in one way or the other, indicating (according to the instructions supplied) that the egg was capable of producing a chick. These adverse experiments, together with the fact that, after all these years, the sex indicators have not come into practical use, show that this method of determining the sex of the future chicken in the egg is of no use to the poultry-keeper whatever.

Shape and Size of Egg

A belief that has persisted is that the long oval-shaped egg will hatch out a cockerel, and the short oval egg a pullet. At various lectures on poultry keeping throughout Victoria this belief has been referred to from time to time by members of the audiences, but so far as the writer of this article is aware there have never been any definite results obtained to support the theory.

Many claims have been made that peculiarities of the shell or of the contents of an egg indicate the sex of the chick that could be hatched from it, but the claims have never been substantiated.

A large egg may produce either a male or female chick, and the same may be said of small eggs. Crew (1925) states:—

> "In the case of the dove and the pigeon, Riddle finds that those eggs which yield females are large and contain more food material for the embryo than those which become males. The size difference is small, however, and the "large" eggs and the "small" eggs vary in size; there is overlapping of the curves when the size is plotted in a graph, and for this reason it is impossible to predict, from the size of the egg alone, the sex of the future bird."

Determination of Sex

It has been established that, in the higher animals at least, the sex of the individual is decided at the time of the fertilization.

In mammals and in most insects the male produces two kinds of sperms, differing in their chromosomes, one capable of producing a male and the other a female. But in the female all the eggs are alike in regard to their chromosomes, and therefore have no influence on the sex of the future embyro. The resulting sex in these animals is, therefore, dependent upon the particular kind of male sperm entering the egg at the time of fertilization. In birds, butterflies, and moths, the position is reversed, the female producing two kinds of eggs differing in their chromosomes, and the male one kind of sperm; so that in the domestic fowl it is the egg that determines the sex of the future chick, some of the eggs having the male determining factor, and some the female determiner.

Theoretically one should then be able to tell the sex of the future chicken by means of a microscopical examination of the chromosomes in the fertilized egg. Practically, however, this is not to be considered, as to do this would mean the destruction of the egg.

With reference to the embryology of the chick, Marshall (1893) states:—

> "During the eighteenth century, facts accumulated rapidly, but the theories quite outpaced them, and the current doctrine throughout the century, supported by many, and, notably, by Haller, was that of preformation, according to which the chick was stated to be present in the egg at the time it is laid, all its parts and organs being there from the beginning, but in an extremely minute and unexpanded condition, the development of the embryo being regarded as a process comparable to the unfolding and enlargement of the several parts of a bud to form the perfect flower."

But with the development of the study of embryology and microscopical research, it was found that the first conspicuous structural feature to make its appearance in the embryo after the laying of the egg and during incubation is the primitive streak. In eggs that have been incubated about sixteen hours the primitive streak, as seen under the microscope, is well developed as a linear groove flanked on either side by ridge thickening. It is during the following days of incubation that the embryo gradually takes form. By careful dissection, it

is found that it is not until the fifth and sometimes the sixth day of incubation that the first indications of the sexual organs become recognizable.

Attempts to Control Sex

Attempts have been made to control the sex by methods of feeding, special matings, &c. In practice, on a large commercial scale, these tests have broken down. It certainly would be a great help to the poultry-keeper to be able to control the sex. With eggs as the chief object on farms where White Leghorns are kept, the females are the birds required. Some poultry-keepers top off their cockerels at various ages, and generally receive good prices, but many consider that the work is hardly worth while, and dispose of them as soon as possible.

It is the opinion of many poultry-keepers that the proportions of sexes in poultry are nearly equal. The sex ratio is influenced by many factors. It is well known that sometimes there is an excess of males, and at other times females. Pearl (1917) recorded the sexes of 20,037 chickens, produced from families of ten and over, and found the proportions to be 944 males to 1,000 females.

Complete List of Qualified Chick Sexers

A list of holders of chick sexing certificates issued by the Department of Agriculture since the commencement of the examinations, in 1938, is shown hereunder :—

SPECIAL CERTIFICATE.

Mr. K. C. McLister, 176 Hall-street, Spotswood, W.14. (Awarded 1939. Accuracy 99·0 per cent.).

Mr. H. A. Jenkin, 18 Corio-street, Belmont, Geelong. (Awarded 1939. Accuracy 98·7 per cent.).

FIRST CLASS CERTIFICATE.

Mr. E. J. Marchant, 56 White-street, Mordialloc. (Awarded 1938. Accuracy 98·0 per cent.).

Mr. T. H. Pettigrove, Fulton-road, Box Hill. (Awarded 1938. Accuracy 97·5 per cent.).

Mr. W. J. Millington, 1 Lyne-grove, West Brunswick, N.12. (Awarded 1938. Accuracy 96·5 per cent.).

Mr. C. Bode, Research P.O. (Awarded 1939. Accuracy 96·0 per cent.).

Mr. A. T. Hewett, Central-avenue, Bayswater. (Awarded 1945. Accuracy 95·0 per cent.).

Mr. L. J. Smith, Cotterell-street, Werribee. (Awarded 1945. Accuracy 95·0 per cent.).

THE POTATO MOTH

In certain seasons, the potato moth may cause losses of up to 60 per cent. of early potato crops, and from 25 to 40 per cent. in mid-season or late crops. Losses, however, may be greatly reduced by taking the following control measures :—

Moulding.—Moulding of crops should be carefully carried out to protect the tubers forming underground. With the variety Up-to-date, which normally produces its tubers close to the surface, such mouldings should be carefully carried out and need to be wide and shallow rather than high and narrow.

Digging.—After digging, bag the potatoes as soon as possible. The practice of placing a fork of dried haulms on top of the sewn or unsewn bags is a bad one. It is much better to sew the bag at once, and turn it upside down. Remove the bagged potatoes from the paddock as soon as possible after digging. Protect potatoes being kept for seed by treating with derris or one of the preparations marketed for this purpose.

[Contributed by the Biological Branch.]

IN THE ORCHARD

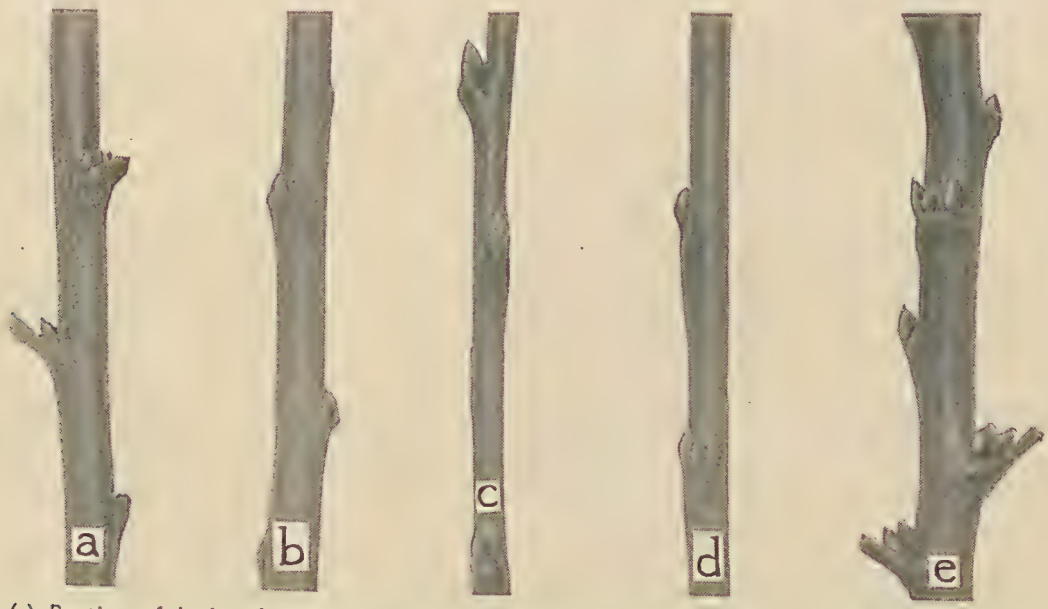
By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

Budding Stone Fruit

THE budding method is the best to use for the reworking of stone fruits and the most suitable time for this operation is during the months of January and February. If a large tree is to be reworked, it should have been cut back severely during the winter so that only the main limbs remained. From the limbs, a large number of shoots would arise during the growing season and these provide suitable growth into which may be placed buds of the required variety. Smaller trees, say two or three years old, may have sufficient annual or two-year wood available into which buds may be inserted. Wood which is older than two years is not suitable for budding.

Home gardening enthusiasts may like to try their hand at this interesting operation. A single peach, plum, or apricot tree, when mature, usually produces a quantity of fruit in excess of that required by a normal household. If the tree has been budded early in its youth to three or four different varieties maturing over a period of several weeks, wastage will be avoided. Budding may be used, also, for growing two or more varieties of cherries, plums, or almonds on the one tree and thus ensuring that, when the tree reaches bearing age, flowers of different varieties blossoming at the same time will provide adequate pollination.

Budding is also the method most used in the propagation of fruit trees. The seedling rootstocks, layers or stools which have been planted out in nursery rows at the start of the season are now ready for the budding operation. There is no reason why this operation should not be one hundred per cent. successful even when performed by amateurs. The main requirement is that the bark on the scion should lift easily. This usually occurs readily at this time of the year. If the season has been dry a thorough watering two or three weeks before the operation is necessary. Budwood of the required variety should be strong and healthy and not less than pencil thickness. In selecting budwood, care should be exercised in making sure that suitable buds are available. It is essential that the buds used should be capable of making shoot growth. Shoot and flower buds are distinct in stone fruits, but they occur together as multiple buds



(a) Portion of bud-stick of Japanese plum with multiple buds, (b) and of European plum with single (growth) buds; (c) thin peach lateral with blossom buds only—unsuitable for budding; (d and e) portions of bud-stick of peach (d) an apricot (e) with multiple buds—suitable. Note:—Some basal remains of petioles have been removed to show the buds.

in apricots, almonds, peaches, and Japanese plums. These multiple buds would be suitable for budding. Single shoot buds occur on annual wood of cherries and these buds should be used.

A sharp knife is essential so that all cuts will be clean and no bruising of delicate tissue will occur. If the budsticks are not required for immediate use, the leaves should be cut off and the cut ends of the sticks dipped in melted paraffin or "heeled in" in moist soil.

The first operation is to make a longitudinal cut in the scion about 1½ inches long, with a smaller cut at the top of this. The two flaps of bark formed by this operation may be easily raised with the back of the knife. The bud should then be cut from the bud stick by making a shallow cut about ¼ to ½ inch above the bud, drawing the knife under the bud and allowing about the same length of bark below the bud. The bud may then be inserted under the flaps of bark on the scion and tied in position with raffia. Some operators prefer to remove the small piece of wood beneath the bud, but this is not essential. The stages in the budding operation are shown in the accompanying illustration.

Details of the budding operation in all kinds of fruit trees are provided in the Bulletin "Budding and Grafting of Fruit Trees". This bulletin may be obtained for the sum of 1s. on application to the Director, Department of Agriculture, Melbourne, C.2.

Walnut Bacteriosis

Owners of walnut trees are frequently disappointed because a large percentage of the nuts developing on their trees have black spots on the husks which extend into the kernel. The trouble is caused by a bacterial disease known as black spot or bacteriosis. Control of the disease is difficult, but the extent of infection may be reduced by burning all infected fruit and fallen leaves. Spraying with Bordeaux mixture, strength 4 : 4 : 80 in the spring before the female flowers open, again after setting, followed by a third spray ten days later will also reduce infection. In planting new trees, varieties which are less susceptible to attack should be chosen. These include Franquette, Treyve Mayette, and Myrtleford Jewel.

Stages in the budding operation for deciduous trees. From left to right; "T" cut on stock, flaps of bark raised; the bud; the bud inserted; tying completed.

Green Manure Crops

Orchardists who intend to sow green crops should make arrangements immediately to secure the necessary supplies of seed and fertilizers. Further notes on green manuring will be supplied in the February issue of the Journal.

Harvesting Almonds

Almonds in northern areas will be reaching maturity towards the end of this month. The separation of the hulls from the shells and a few nuts falling on the ground are indications that the nuts are ready for harvesting. The cleanest method of harvesting is to spread a sheet of canvas or burlap around the tree and knock the branches with slender rods of dowelling or bamboo. If sheeting is not available, the soil should be levelled by rolling prior to harvesting. The nuts must be collected immediately, otherwise they will become stained if left on the ground. Hulls should be removed immediately and the nuts should be loosely stacked in boxes in a warm, airy situation where they will dry out. In bagging the nuts, the different varieties should be kept separate.

Nuts which are to be sold in the shell may be improved in appearance by sulphuring. This is done by spraying the nuts with water and then stacking in trays in a box in which sulphur is burning for about 30 minutes.

into the stubble; in the latter case 2 lb. of seed per acre is recommended. Sufficient subterranean clover should develop without any further sowing.

It is desirable to sow seeds rather deeply under north-eastern conditions as the top ½ inch of soil readily dries out and sowing of seed and fertilizer to a depth of ½ to ¾ inch is recommended for most soil types.

The method generally so successful in the southern part of the State of top sowing seed into native grassland, is more hazardous in the north-east because the soils are lighter in texture and atmospheric conditions drier. If this method is to be successfully employed, it is essential to sow only under favourable climatic conditions and when there are good reserves of moisture in the soil. Should a good seasonal break occur early in the year then April seeding with a "combine" might be carried out successfully. On poor land the risk is great even with fairly good autumn rains and it is safer to give the land a shallow ploughing and sow on a prepared seed bed.

In the north-east the soils are generally deficient in phosphorus and the regular use of superphosphate is recommended as a means of overcoming this deficiency. Trials of various quantities of superphosphate have shown that a marked and progressive response occurs to increasing amounts of "super" during the early years of application, but as soil fertility builds up the differences between ½, 1, and 2 cwt. per acre become less evident. The amount that can be used with profit depends principally on the rainfall.

Generally speaking, potassic fertilizer has not given any substantial response in the north-east, although lime has in some places promoted a very strong growth. At Kilmore on poor "ironstone" soils derived from silurian sediments the response to all forms of lime applied has been very positive, while a few miles south of Wangaratta on alluvial soil in the King Valley a good response has occurred, which is expressed as a more vigorous development of annual grasses.

The ratio of grass to clover in pastures is important and generally clover is too prominent in pastures in the north-east principally because insufficient attention is given to grazing management. Lenient grazing encourages grass growth while close continuous grazing produces a clover dominant pasture. In the absence of a perennial grass, improved pastures that are heavily grazed readily become colonized by high-fertility weeds such as "long stork's bill", cape weed, and mustard weed.

To exercise any satisfactory control of grazing management it is essential to subdivide large paddocks and have reserves of fodder on hand. As pastures improve and more stock are carried the need for conserved fodder becomes vital.

In general, conditions in the north-east are good for hay making and most of the surplus spring growth is conserved in this form and baled for ease of storage and feeding out. The practice of making silage, although general, is not as popular as hay making on account of the additional labour required.

Maize, millet, and the sorghums can be grown satisfactorily on the alluvial soils in the valleys and good stands of lucerne are cultivated in well drained situations.

The soils generally in the north-east are very subject to gully and sheet erosion and on this account pasture improvement to build fertility and stabilize the soil, coupled with proper grazing management to ensure always that the soil is protected by vegetation, is important.

List of Pasture Experimental Plots Conducted by the Department of Agriculture for the Victorian Pasture Improvement League

A. Non-Irrigated Pastures (38).

1. *Manurial Trials* (30).—Bochara, Buckley, Callignee, Cobrico, Coldstream, Cooriemungle (2), Cudgee, Dean's Marsh, Ellinbank (2), Euroa (3), Fish Creek, Foster (2), Garvoc, Heathmere, Heywood, Kergunyah, Larpent, Leongatha (2), Longwarry, Noorat, Penshurst, Pirron Yallock, Poowong, Port Fairy, Rickett's Marsh, Sisters, Timboon, Traralgon, Wandong, Wangaratta, Yanakie.

2. *Species Trials* (8).—Cobrico, Cooriemungle (2), Cudgee, Foster, Kergunyah, Wandong, Wangaratta.

B. Irrigated Pastures (9).

1. *Manurial Trials* (7).—Cohuna, Koroop, McMillan's, Maffra, Stanhope, Swan Hill, Tongala, Tragowel.

2. *Species Trials* (2).—McMillan's, Tragowel.

IRRIGATED PASTURES

Notes by L. C. BARTELS, B.Agr.Sc., Senior Agrostologist

A luxuriant pasture of white clover growing under irrigation.

The value of irrigation in the recent dry seasons has been incalculable. Victoria has adopted a progressive policy in water conservation and the total capacity of water storages controlled by the State Rivers and Water Supply Commission approximates to 2,000,000 acre-feet. In the year 1943–44 the area irrigated was a record of 665,000 acres. Two-thirds of this area was irrigated pasture. Some was natural pasture but predominantly it consisted of cultivated grasses and clovers which have become the most important crop grown in the irrigated agricultural areas. This development is a notable one and is based on the results of tests with irrigated grass and clover mixture made mainly at the State Research Farm at Werribee, initiated in 1913.

Since 1924 the Department of Agriculture has conducted irrigated pasture tests in the northern irrigation areas. The results have been remarkable. Increased production from dairying has been achieved in all irrigation centres, and the sustained production on leading farms indicates that practices are soundly based. The best farmers are exponents of Departmental teachings and they have adopted pastures as the basic crop on their farms.

Every one familiar with agricultural progress in Victoria knows what has been achieved in recent years by pasture improvement to augment production and to arrest the decline in fertility evident in many places through the long drain on our soils, but the rapid extension of pastures under irrigation is a new development and experiments and extension of knowledge concerning irrigated pastures are still urgent matters. It is in this connexion that the Victorian Pasture Improvement League has greatly helped the Department, and until the war intervened much of the experimental work in the north embodied Pasture Improvement League projects. The reclamation of salted land in the Kerang district by pasture development was an example, and striking proof has been obtained regarding the adaptation of mixed pastures to the conditions in that area.

Mr. A. Morgan, B.Ag.Sc., who had been closely associated with the experimental work on irrigated pastures at Werribee, initiated Pasture Improvement League work at Kerang. Mr. Morgan has now been appointed District Irrigation Officer in that district. He had made progress in extending knowledge of irrigated pastures among district farmers, but that work has been suspended because he has been filling the position of chairman of the local War Agricultural Committee, but it is hoped that he will soon be able to resume his normal work.

The plots at Tragowel and Koroop have been retained and other irrigation pasture plots maintained as observation plots are at Cohuna, Tongala, Stanhope, and Maffra.

When mixed pastures were first adopted tentatively by irrigation farmers, they were always compared with lucerne, which was such an important crop in the early years of

development in the closer settlement irrigation areas and had maintained its reputation as a crop of outstanding merit, but it has its limitations and the mixed pastures soon asserted themselves first as a complement to lucerne and then as a suitable basic crop which was flexible enough to suit practically all conditions. As was forecast twenty years ago mixed pastures have revolutionized dairying in the irrigation areas.

The popularity of irrigated pastures grew as the factors governing their growth became better understood, and the first feature which commended them was their ability to withstand hard grazing. Pastures grew well in wet places where lucerne would not grow, and this meant too that they were not so rapidly killed by excess irrigation water which was detrimental to lucerne. These were negative qualities but pastures soon demonstrated their high carrying capacity which was maintained over the years. Unlike lucerne they were most effectively utilized by grazing; they improved rather than deteriorated with age. By virtue of the soil enriching powers of the clovers and the stock droppings they built up rather than depleted soil fertility. In fact irrigated pasture lands have been eagerly sought for vegetable growing, and at Werribee there has been a big development in this direction.

An interesting commentary on irrigated pastures and their place in farm economy is that at Maffra experienced sugar-beet growers cannot be induced to plough up established pastures for beet culture.

Pastures have definitely opened new prospects for dairy farmers in irrigated areas, and they are not limited by geographical considerations in Victoria. In the extreme north-west of the State at Lindsay Point above the latitude of the Murrumbidgee irrigation areas, excellent irrigated pastures are grown, and yet Mildura draws a big portion of its milk supply from Gippsland. There is a big field for pasture improvement in areas where water is available at reasonably low cost.

When pastures were new it was feared that they would not withstand dry seasons and water shortages, and departmental officers awaited the first severe test with apprehension. It came in 1938 and although the pastures, particularly the delicate white clover, dried up they revived quickly in 1939.

Farmers who are anxious now about the future of their pastures may expect a similar revival in most cases when normal irrigations are again practicable after the drought. Plants such as lucerne and paspalum show great hardiness in drought times and farmers become interested in them in dry periods.

The factor which has governed the development of irrigated pastures above all is soil fertility. Liberal topdressing with superphosphate has induced such profuse growth of first class pastures of rye grass, white clover, strawberry clover, cocksfoot, prairie grass, &c., that one leading dairy farmer on an 86-acre irrigated block in the Goulburn Valley produced 1 ton of milk for fourteen days in succession in the spring of 1943. This was the culmination of progressive development since 1924 and is one case in refutation of much nonsense which is talked about the inevitable deterioration in land which the use of artificial manures is supposed to induce.

RECLAMATION OF SALINE SOILS

Notes by A. MORGAN, B.Agr.Sc.,
District Irrigation Officer

Broadly speaking, the difficulty of reclaiming salt-affected soils under irrigation conditions is related to the height of the free water table. With any particular area of "salty" land, there may be local factors such as a confluence of channels, a sandy area allowing undue seepage from the channel, or some such local feature which makes the task of reclamation more difficult, but on the average it is safe to say that where the permanent water-table is not closer to the surface than 4 ft. the land can be reclaimed by the intelligent use of irrigation water and proper lay-out for irrigation.

The standards of lay-out commonly referred to in this Department's publications on irrigated pastures and lucerne are the ones most suitable for reclaiming "salty" land for pasture and lucerne production. Bays should not be more than 44 feet wide, and not more than 10 chains long on ordinary loamy soils; in sandy soils the length of the bay may well be reduced to 5 chains.

The principle involved in lay-out is to provide one which gives a *uniform* absorption of irrigation water over the area, but which at the same time restricts that absorption to not more than 4 inches at a watering.

A great proportion of the "salty" land has a permanent water-table at about 30 inches from the surface. The reclamation of this land involves more expense and takes longer to accomplish; furthermore, such areas are

usually more subject to local factors referred to above, and it is difficult, or perhaps impossible, to eliminate them. A study must then be made of the local conditions by means of test-wells, and some records kept of the fluctuations in the water-table with the idea of linking them up with local sources of seepage. When it is reasonably certain that a local source of seepage has been discovered, appropriate steps, such as provision of surface drainage, or the pugging or concreting of a section of channel which passed through sandy ground, can be taken.

A necessary corollary is the establishment of surface cover, for which pasture plants are ideally suited. Seeding should be deferred, however, until the natural growths of annual grasses, &c., indicate reasonable conditions for germination of clovers and grasses. Seeds mixtures may be the same as recommended for ordinary irrigated pastures.

Seasonal Conditions during 1944

The following extracts are taken from a summary of weather conditions made available by the Central Weather Bureau, Melbourne:—

"Rainfall for 1944 was under average over practically the whole of Victoria. Deficiencies were considerable north of the Divide and less than 50 per cent. of the average was received in a strip of country between Hopetoun (Mallee) and Rochester (North Country). The only areas to receive more than 75 per cent. of the average were the Western, West Gippsland, and East Central districts. Totals were within 10 per cent. of normal near the West Coast and in the Lilydale–Walhalla–Wonthaggi area.

"Except in the Western District in February, the first three months were exceptionally dry. At Melbourne, the total for the three months, December to February, was the lowest on record and the mean for ten representative northern stations was the second lowest on record. April and May were much better months, over average totals being recorded in all but small areas of the north-west. From June onward, however, very dry conditions again prevailed. June, August, and September were the driest on record in some parts of the State. Less than 25 per cent. of the average was recorded in each of these months in most of the north. A considerable improvement was experienced in the south-western parts of the State in December, and some good local rains fell in parts of the north-east, but conditions were still dry from Gippsland to the Southern Mallee.

"Mean temperatures were about normal or slightly below over most of the State. The early summer and spring months were warm, and March also in some districts, but in the remaining months of the year mean temperatures were under average. Departures from normal were greatest in April (— 3° to — 5°), February (— 2° or — 3° in the north) and September (+ 1½° to + 3°). These were largely the result of variations in day temperatures (represented by daily maxima). Night minima were two or three degrees below the average generally in August, and in the north and west in June, and severe frosts occurred at intervals during the winter and spring months.

"Deterioration in the condition of stock early in the year was checked by the rains of April and May, though hand feeding continued in the north and north-west. However, dry conditions resulted in more widespread hand feeding and considerable losses, and in the removal to agistment or sale of stock in the north and north-west. Frost and lack of rain held back any marked improvement in pastures after May, and by August wheat had to be brought into the north-west of the State to cover the deficiency in natural feed. A further decline in the condition of pastures followed; by November pastures were drying off in the south, while in the north-west they were bare and in many districts with wind erosion occurring."

Fortunately timely spring rains in the southern part of the State caused a good late spring growth, and a considerable quantity of pasture hay and silage was conserved in the Southern-western District and in parts of Gippsland.

Because of the rationing of superphosphate, pasture growth generally throughout the year showed a decline.

MEAN DISTRICT RAINFALL COMPARED WITH THE AVERAGE FOR PREVIOUS YEARS.

District.	Mean 1944.	Average.	Percentage Departure from Average.
	Points	Points	%
Mallee	659	1,263	— 48
Wimmera	1,046	1,777	— 41
Western	2,430	2,777	— 12
Northern Country ..	924	1,810	— 49
North Central ..	1,710	2,716	— 37
Central	2,397	2,956	— 19
North-east	2,072	3,459	— 40
Gippsland	2,754	3,353	— 18

MONTHLY RAINFALL FOR RECORDING STATIONS NEAREST TO EXPERIMENTAL PLOTS IS AS FOLLOWS:—

Plot.	Recording Station.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Total.	
		1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.	1944.	Average.
Benalla ..	Benalla ..	12	*157*	26	*132*	83	*174*	212	*203*	308	*242*	105	*327*	197	*271*	5	*272*	68	*242*	115	*240*	117	*172*	162	*153*	1,410	*2,585*
Bochara ..	Hamilton	45	*128*	140	*114*	70	*160*	280	*213*	374	*267*	129	*305*	280	*285*	93	*302*	196	*296*	348	*256*	168	*191*	282	*178*	2,405	*2,698*
Buckley ..	Winchelsea	118	*109*	51	*122*	53	*149*	184	*162*	407	*185*	72	*211*	68	*189*	69	*201*	134	*217*	192	*191*	136	*171*	153	*143*	1,637	*2,050*
Callignee	Callignee South	137	*241*	60	*266*	239	*291*	514	*359*	1,003	*311*	434	*142*	253	*366*	240	*109*	221	*390*	253	*309*	333	*377*	416	*334*	4,103	*4,095*
Cobrico ..	Terang ..	135	*151*	180	*139*	121	*193*	343	*243*	447	*293*	186	*312*	275	*316*	131	*344*	233	*313*	271	*265*	228	*230*	373	*178*	2,923	*2,977*
Cohuna ..	Cohuna ..	17	*96*	27	*75*	37	*94*	145	*112*	123	*140*	22	*165*	81	*129*	0	*143*	35	*129*	121	*138*	48	*90*	122	*92*	778	*1,403*
Coldstream	Lilydale ..	171	*243*	182	*200*	288	*261*	637	*315*	897	*280*	291	*335*	253	*301*	128	*306*	231	*322*	378	*361*	200	*279*	262	*287*	3,818	*3,490*
Coorie-mungle	Coorie-mungle	134	..	241	..	117	..	376	..	555	..	262	..	439	..	179	..	281	..	349	..	301	..	382	..	3,619	..
Cudgee ..	Allansford	81	*134*	216	*142*	134	*175*	367	*218*	425	*293*	191	*332*	423	*330*	152	*311*	184	*321*	379	*266*	210	*211*	217	*173*	2,979	*2,909*
Deans Marsh	Penny Royal	123	*141*	103	*147*	78	*199*	286	*243*	592	*305*	143	*360*	207	*321*	119	*346*	186	*321*	206	*287*	164	*213*	249	*183*	2,456	*3,072*
Elinbank	Warragul	127	*259*	86	*193*	325	*285*	508	*354*	803	*359*	264	*387*	217	*346*	134	*415*	257	*411*	279	*421*	223	*335*	376	*321*	3,599	*4,086*
Euroa ..	Euroa ..	3	*144*	9	*122*	58	*169*	204	*185*	401	*242*	83	*338*	199	*259*	3	*276*	48	*239*	143	*235*	91	*159*	69	*152*	1,311	*2,520*
Fish Creek	Fish Creek	145	*218*	124	*214*	164	*273*	349	*411*	489	*273*	282	*412*	195	*355*	144	*433*	185	*309*	256	*312*	232	*336*	368	*288*	3,133	*3,864*
Foster ..	Foster ..	194	*265*	69	*239*	184	*327*	546	*428*	610	*397*	416	*485*	221	*411*	219	*460*	225	*460*	267	*421*	297	*326*	511	*314*	3,759	*4,533*
Garvoc ..	Terang ..	135	*151*	180	*139*	121	*193*	343	*243*	447	*293*	186	*312*	275	*316*	131	*344*	233	*313*	271	*265*	228	*230*	373	*178*	2,923	*2,977*
Heywood	Heywood	94	*131*	187	*137*	89	*170*	391	*255*	397	*335*	152	*394*	479	*411*	142	*397*	190	*359*	339	*276*	228	*210*	273	*184*	2,961	*3,259*
Kerang ..	Kerang ..	13	*75*	4	*87*	127	*100*	117	*101*	150	*137*	10	*158*	63	*129*	7	*137*	23	*133*	102	*131*	120	*95*	110	*110*	846	*1,393*
Kergunyah	Kergunyah	54	*183*	32	*190*	88	*254*	255	*223*	387	*318*	84	*472*	229	*396*	23	*367*	85	*313*	266	*323*	108	*225*	254	*227*	1,865	*3,491*
Koroop ..	Mead ..	10	*75*	12	*94*	26	*83*	103	*79*	131	*132*	19	*147*	60	*133*	0	*132*	25	*135*	86	*132*	48	*82*	134	*108*	654	*1,332*
Larpent ..	Colac ..	88	*135*	84	*133*	68	*186*	264	*207*	370	*267*	140	*318*	209	*286*	129	*333*	165	*290*	190	*254*	153	*204*	239	*166*	2,099	*2,779*
Leongatha	Leongatha	176	*235*	87	*195*	214	*293*	432	*342*	478	*349*	327	*384*	194	*338*	162	*396*	282	*393*	210	*373*	194	*305*	372	*290*	3,128	*3,893*
Longwarry	Longwarry	150	*221*	100	*201*	320	*281*	493	*287*	584	*314*	239	*294*	146	*271*	120	*343*	231	*324*	336	*389*	237	*299*	287	*304*	3,243	*3,531*
Maffra ..	Maffra ..	57	*203*	14	*166*	153	*210*	261	*173*	791	*142*	58	*185*	55	*152*	53	*154*	56	*194*	145	*230*	80	*188*	117	*213*	1,840	*2,210*
McMillans	Kerang ..	13	*75*	4	*87*	127	*100*	117	*101*	150	*137*	10	*158*	63	*129*	7	*137*	23	*133*	102	*131*	120	*95*	110	*110*	846	*1,393*
Noorat ..	Terang ..	135	*151*	180	*139*	121	*193*	343	*243*	447	*293*	186	*312*	275	*316*	131	*344*	233	*313*	271	*265*	228	*230*	373	*178*	2,923	*2,977*
Penshurst	Penshurst	63	*134*	143	*126*	48	*169*	293	*226*	394	*276*	129	*300*	239	*292*	80	*299*	186	*303*	294	*255*	136	*182*	270	*161*	2,275	*2,723*
Pirron Yallock	Tomahawk Creek N.	92	*157*	86	*153*	64	*194*	255	*250*	373	*307*	141	*357*	201	*336*	108	*377*	179	*337*	189	*302*	165	*218*	269	*186*	2,743	*3,174*
Poowong	Poowong	202	*250*	111	*195*	268	*304*	526	*393*	684	*390*	383	*452*	131	*407*	199	*427*	282	*418*	272	*418*	314	*332*	438	*324*	3,810	*4,310*
Port Fairy	Port Fairy	66	*146*	252	*144*	76	*184*	367	*227*	475	*314*	192	*333*	429	*342*	101	*332*	225	*296*	270	*238*	176	*192*	221	*156*	2,850	*2,904*
Rickett's Marsh	Birregurra	103	*111*	51	*132*	72	*177*	257	*178*	395	*241*	107	*271*	126	*276*	105	*303*	164	*286*	183	*233*	121	*202*	221	*162*	1,905	*2,572*
Sisters ..	Mortlake	96	*143*	148	*124*	93	*168*	309	*212*	372	*252*	124	*280*	183	*261*	111	*293*	193	*277*	242	*257*	201	*201*	277	*165*	2,349	*2,633*
Timboon	Timboon	140	*169*	280	*176*	110	*231*	374	*290*	484	*350*	252	*415*	500	*412*	160	*477*	283	*375*	353	*326*	259	*259*	324	*191*	3,519	*3,671*
Tongala ..	Tongala ..	0	*107*	25	*117*	31	*106*	138	*179*	210	*108*	29	*174*	118	*189*	0	*165*	32	*123*	100	*158*	56	*84*	97	*114*	836	*1,624*
Tragowel..	Kerang ..	13	*75*	4	*87*	127	*100*	117	*101*	150	*137*	10	*158*	63	*129*	7	*137*	23	*133*	102	*131*	120	*95*	110	*110*	846	*1,393*
Wandong	Heathcote Junction	72	*171*	31	*230*	91	*212*	279	*283*	443	*233*	86	*291*	188	*228*	57	*284*	121	*199*	171	*264*	103	*191*	209	*204*	1,851	*2,790*
Wangaratta	Wangaratta	9	*142*	14	*152*	58	*191*	171	*196*	232	*215*	68	*310*	176	*246*	5	*253*	47	*225*	194	*234*	103	*169*	181	*161*	1,258	*2,494*
Yanakie ..	Foster ..	194	*265*	69	*239*	184	*327*	546	*428*	610	*397*	416	*485*	221	*411*	219	*460*	225	*460*	267	*421*	297	*326*	511	*314*	3,759	*4,533*

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86
Armstrong and Son	Wangaratta	105
Ballarat Orphanage	Ballarat	132
Banyule Stud Pty. Ltd.	Wangaratta	55
Beggs, A. R.	Beaufort	88
Black, I. S. Estate	Mount Noorat	60
Carne, W. J.	Pakenham Upper	27
Clark, W. J.	Monomeith	140
Cowan, G. L. S.	Bacchus Marsh	59
Cribbes, T.	Wangaratta	39
Deering, J. T.	South Wangaratta	86
Dennis, Mrs. A. A.	Frankston	23
Dookie Agricultural College	Dookie	92
Everist, F. R.	Tyabb	20
Foletta, G. G. and Son	Buxton	120
Geelong Grammar School	Corio	78
Gorman, A. W.	"Catheart," Alexandra	57
Griffin, G. W.	Gladysdale	50
Griffiths, J. G.	Benalla	151
Gross, Mrs. G. F.	Green Lake	21
Hamilton, A.	Flinders	64
Howlett Mrs. G., and Miss E. Samuel	Lang Lang	55
Jakobi, L. W.	"Granada," Yannathan	89
Johnson, F. G.	Horsham	11
Kilmany Park Farm Home for Boys	Sale	105
Lady Talbot Milk Supply Co.	Cranbourne	513
Lawrence, P. H.	"Rainga," Tarrawarra	83
Light, D. T.	Noradjuha	8
Longerenong Agricultural College	Dooen	42
Maloney, P. J.	Tongala	66
Middleton, J. A.	Longwarry North	70
Murray, M. G.	Lima	26
McIntosh, J.	Merrigun	35
McNabb and Son, G. A.	Irrewillipe East	159
Nancarrow Bros.	Korang	48
Noonan, G.	Benalla	35
Noonan, Mrs. S. A.	Benalla	51
Northcote Children's Farm	Bacchus Marsh	48
Onley, W. H.	"Glenholme," Caldermeade	76
Parker, Mrs. L. M.	Tallarook	67
Payne, A. E. T.	"Yarra View," Lilydale	67
Payne, T. E. N.	"Woodburn," Kilmore	44
Poole, M. A., and D.	Caldermeade	120
Poole, M. A., and D.	Yannathan	104
Potter, W. J.	Longwarry North	130
Powell, T. S.	"Carellen," Mansfield	43
Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Roe, Thomas H. P.	Cobram	27
School of Horticulture	Burnley	6
State Experiment Farm	Rutherglen	47
State Research Farm	Werribee	245
Stephens, Dr. F.	Vermont	32
St. Joseph's Home	Sebastopol	53
Vagg, T. R.	Officedale	40
Vagg, E. J.	Leongatha	48
Warnock, J. A.	Benalla	76
Waterhouse and Son	Pakenham	55
Wells, W. G.	Caldermeade	67
Woodyer, P. A.	Mornington	19

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.
Abbey, S. G.	Mernda	7
Alexander, Miss R.	Ballarat East	1
Almond Bros.	Mernda	112
Anderson, A. R.	Craigieburn	123
Anderson, Mrs. N. J.	North Geelong	18
Andison, J. A.	Thomastown	53
Andrew, J. C.	Whittlesea	47
Andrew, J. H.	Whittlesea	18
Andrew, T. S.	Whittlesea	91
Andrew, W.	Whittlesea	123
Andrews, E. H.	Templestowe	19
Angliss, Mrs. R.	Ballarat	1
Angus, W.	Moolap	6
Armstrong, Mrs. M. A.	Sebastopol	15
Artley, A.	Sebastopol	11
Atkinson, A.	Cambrian Hill	21
Atkinson, V.	Cambrian Hill	26
Attwood, F. A.	Eaglehawk	18
Baddon, D. W.	Yarragon	74
Baglin, E.	Wallington	14
Baker, A.	Bannockburn	32
Balharrie, J. A.	Whittlesea North	68
Banfield, J. G.	Rosanna	66
Barclay, A. H.	Whittlesea	93
Barker, Mrs. E. M.	Huntly	11
Barron, Mrs. A.	East Brunswick	10
Bates, D. S.	Whittlesea North	22
Bates, J.	Connewarre	21
Batten, R. J.	Wollert	51
Beasley, R.	Youroke	18
Bebbington, J.	Whittlesea	82
Beck, J. P.	Ceres	48
Beck, R. S.	Ceres	34
Bellis, Mrs. A.	Fyansford	15
Benson, R.	South Morang	40
Bertuch, A. W.	Harcourt North	22
Best, J. H.	Yarragon	36
Best, W. H.	Yarragon	24
Best and Carter	Yarragon	110
Bingley, R. P.	West Geelong	31
Blackmore, P. J.	Ballarat North	57
Blake, Mrs. J.	Yarragon	11

Name.	Address.	Number in Herd at Last Test.
Blood, J.	Ballarat	8
Blythe, R. E.	Conneware	71
Bodycoat, A.	Wollert	40
Boland, Mrs. A.	Yarragon	31
Boland, D.	Yarragon	40
Bone, E. R.	Bell Brae	14
Booth, Mrs. A.	Warrandyte	7
Borland, J.	Yarragon	87
Bourke, C. G. D.	Upper Plenty	51
Bourke, G. J.	Fairfield	82
Bourke, J. W.	Somerton	33
Bourke, W. J.	Alfredton	26
Bradbury, G.	Kangaroo Flat	28
Brady and Cunningham	Doncaster	28
Brain, J. A.	Ceres	41
Bray, Mrs. O. C.	Glenroy	34
Brereton, E.	Kennington	25
Briers, J.	Queenscliff	5
Brock, J. N.	Epping	16
Browell, L.	Golden Square	15
Brown, J.	Geelong West	6
Brown, Mrs. A.	Maiden Gully	11
Brown, R.	Kennington	4
Brown, W.	Coburg	77
Brownhill, C. E. H.	Bundoora	2
Bryden, A. C.	Bendigo	17
Bumpstead, K.	Moolap	10
Bunting, J.	Epping	30
Burke, T. S.	Huntly	19
Burns, D.	Moolap	8
Burville Bros.	Mt. Duneed	40
Butler, W.	Wallan	69
Cahill, J. M.	Warrandyte	8
Callaghan Bros.	Thomastown	66
Callaghan, L.	Epping	32
Callaghan, T.	Thomastown	60
Cameron Bros.	Belmont	67
Cameron, G. A.	Connewarre	36
Cameron, J. J.	Connewarre	53
Campbell, T. S.	Yarragon	8
Cardwell, E. F.	Whittlesea	62
Carroll, M.	Fyansford	28
Carr, G.	Leopold	20
Carr, W. J.	Wollert	62
Carter, R. H.	Fyansford	23
Catt, G. P.	Yarragon	53
Cavagna, Miss	Sedgwick	7
Challis, L. J.	Connewarre	57
Chandler, K. J.	Doreen	29
Charles, J. E.	Torquay	36
Chilli, G. P.	Epping	43
Christian Bros.	Doreen	38
Clark, H. M.	Nerrina	18
Clark, P. W.	Whittlesea	68
Clark, W. and T.	Kal Kallo	68
Clemence, S.	Warrenheip	23
Close, A. E.	Ballarat	37
Clunes, P.	Coburg	42
Cochrane, C.	Ballarat North	31
Cochrane, Mrs. E.	Hurstbridge	4
Cocks, J. J.	Marong	17
Collis, R.	Yarragon	1
Conway, L. T.	Sedgwick	10
Cook, W.	Brown Coal Mine	133
Cooke, Mrs. C. H.	Moolap West	30
Cooke, S. J.	Belmont	38
Cornfoot, D. H.	Whittlesea	44
Cotchin, E.	Epping	57
Coulter, G.	Ballarat North	19
Coulthard, J. J.	Whittlesea	72
Cox, E. H.	Heidelberg	65
Cox, H. S. and W. F.	Miners Rest	67
Crack, Mrs. E.	Bendigo	12
Craker, Mrs. H.	Warrandyte	5
Crawford, J.	Yarragon	44
Cross, G. A.	Mount Rowan	22
Crowe, P.	Gnarwarre	20
Crowle, A. J.	California Gully	16
Cuddihy, T.	Lovely Banks	26
Curtis, W. D.	Wallington	35
Dans, C.	Connewarre	80
Davey, C.	Morwell	103
David, Mrs. M.	Ballarat	2
Davies, A. H.	Drysdale	20
Davies, G.	Canadian	29
Dawson, J. F.	Whittlesea	41
Delany Bros.	Broadmeadows East	80
Dendle Bros.	Moolap	19
Dennett, C. A.	Craigieburn	40
Deppler, L.	Batesford	16
Deppler, W. W.	Yarragon	91
Deutscher, H. W.	Mernda	137
Devereux, Mrs. A.	Ballarat 6	—
Dickinson Bros.	Sebastopol	54
Dillon, L. W.	Epsom	18
Doggett, T.	Kangaroo Flat	17
Douglas, Mrs. J.	Alfredton	52
Downey, J.	Bellarine	41
Downing, J.	Canadian	5
Dowton, Mrs. H.	Yarragon	47
Draper, L. S.	Wollert	35
Draper, T. B.	Whittlesea	43
Drechsler, J.	Sedgwick	26
Duke, J.	Ballarat East	1
Dunnett, M.	Yan Yean	26
Dunstan, W.	Pascoe Vale	29
Dwyer, F. P.	Greensborough	40
Dwyer, J.	Donnybrook	28
Earl, H.	Highton	3
Eckersley, W. H.	Alfredton	40
Edwards, S. R.	Sebastopol	14
Elder, W. C.	Epping	54
Elford, S.	Magpie	34
Ellis, P.	Tullamarine	19
Erwin, E. J.	Connewarre	13
Evans, D.	Mount Duneed	15
Evans, G.	Marshall	41
Fairbrother, J. E.	North Geelong	23
Faulkner, G.	Yarragon	40
Fergusson, M. A.	Whittlesea	98
Ferres, Mrs. M. E.	Mount Clear	21
Finn, J.	Templestowe	38
Fitzpatrick, W.	Mandurang	9
Fitzgerald, D.	Leopold	45
Fitzgerald, E.	Leopold	30
Fitzsimmons, B.	Lower Templestowe	35
Flanagan, A. D.	Epsom	10
Flannagan Bros.	Batesford	81
Flynn, O.	Epsom	21
Foot, Mrs. R. G.	Connewarre	19
Fox, A.	Mernda	53
Fox, Mrs. C. H.	Epping	48
Franklin Bros.	Sebastopol	29
Franklin, F. M.	Sebastopol	15
French, T. W.	Wollert	57
Friswell, H.	Bendigo	42
Fuller, R. J.	Connewarre	30
Galbraith and Walker	Greensborough	31
Gallagher, J.	Golden Square	20
Gallus, E. H.	Doncaster	13
Gamble Bros.	Greenvale	153
Gardiner, A. M., Estate of	Whittlesea	101
Gardiner, C. E.	Epping	29
Gargan, M. J.	Marshall	43
Gass, S. Mc.	Wollert	20
Gentner, H.	Eaglehawk	9
Gerrett, W. T.	Ballarat North	19
Gibbs C.	Arthur's Creek	30
Gillett, R. L.	Cherry Tree, Sebastopol	23
Godfrey, A. J.	Yarragon	49
Godfrey, W. and W.	Moolap	42
Gogoll, Mrs. M. L.	Torquay	6
Gooch, W. N.	Sydenham	61
Goodfellow, P. W.	Preston	70
Goulden, J. B.	Wilson's Reef	54
Graco, Bros.	Keilor	24
Graff, Mrs. M. G.	Mernda	16
Graham, A. E.	Connewarre	35
Graham, A.	Whittlesea	39
Gray, J. H.	Herne Hill	74
Green, J.	Eppalock	15
Green, R.	Leopold	27
Greer, A.	Wollert	19
Griggs, Mrs. H.	Yarragon	47
Grinter Bros.	Whittington	52
Grinter, T.	Whittington	33
Guidice, J. J.	Kangaroo Flat	17
Gunn, A. J. B.	Ballarat	7
Gunn, W.	Kangaroo Flat	10
Hall, A. M.	Bullock Creek	31
Hall, Mrs. J. E.	Whittlesea North	9
Hall, W. J.	Essendon	16
Halliwell, G.	Wollert	84
Hamilton Bros.	Huntly	17
Hamilton, C. H.	Yarragon	59
Hamilton, T. D.	South Geelong	32

Name.	Address.	Number in Herd at Last Test.
Hancorne, Miss M. R.	Yan Yean	33
Hanmer, Mrs. J. T.	Kellor	63
Hanrahan, Miss E.	Sebastopol	4
Hanrahan, N.	Sebastopol	6
Hargrave, Mrs. E. J.	Whittlesea	26
Hargreaves, W.	Emu Creek	10
Harkness, H. J.	South Morang	12
Harmer, L. T.	Thomastown	38
Harrison, H. N.	Ballarat	17
Harvey, J. and L.	Yarragon	79
Harvye, Mrs. M. M.	Yarragon	78
Hawkes Miss D.	Warrandyte	14
Hayes J. J.	Smythe's Creek	6
Hedges J. T.	Ballarat	9
Hegarty J.	Trunk Lead	4
Hehr R.	Wollert	29
Henderson J.	Donnybrook	58
Henshaw E.	Lower Templestowe	9
Herd J.	Epping	38
Hewitt C. J.	Wattle Glen	7
Hewitt H.	Ballarat	13
Hickinbotham Miss N.	Whittington	10
Higgs, R. N.	Yan Yean	58
Hilderbrand, P.	Sebastopol	21
Hill, H.	Campbellfield	48
Hill, J.	Somerton	63
Hill, J. E.	Mt. Duneed	20
Hill, R.	Highton	23
Hill, W.	Ceres	25
Hill, W.	Somerton	70
Hinchcliff Bros.	Whittington	74
Hobbs, Mrs. F. J.	Doncaster	6
Hocking, A. R.	Canadian	12
Hoctor, J. and Son	Greenvale	34
Hodgins, J.	Alfredton	2
Hogan, Miss M.	Cambrian Hill	20
Hogan, M.	East Preston	58
Hollier, A. H.	Yarragon	16
Hooper, A.	Moolap	15
Hooper, W. R., jun.	Mickleham	2
Hose, W. J.	Grovedale	33
Houlahan, P.	Eppalock	40
Houlahan, T. J.	Eppalock	43
Howden, W.	Coburg	70
Howe, D. J., V. A., and G. S.	Yarragon	30
Huggins, R. E.	Ballarat	1
Hughes, Mrs. R. E.	Ballarat East	14
Hurrey, T. H.	Yan Yean	44
Hutchinson, J. B.	Drysdale	23
Hynes Bros.	Grant-street, Sebastopol	8
Ireland, C. E.	Yarragon	17
Irish, E. B.	Napoleons	19
Jackson, A.	Glenroy	51
Jackson, Mrs. M. A.	Heidelberg	7
Jackson, J.	South Warrnambool	3
Janefield Farm	Bundoora	43
Jeffrey, J. T.	Mernda	100
Jenkins, Mrs. A.	Mount Rowan	22
Jenkins, T. H.	Whittlesea	22
Jennings, W.	Barwon Heads	46
Jinks, J.	Curlewis	43
Johns, A.	Highton	34
Johnstone, Miss J. A.	Mernda	9
Jolly, Miss P.	Epping	55
Jones, A. J.	South Morang	37
Jones, I.	Lovely Banks	43
Jones, S. E.	Campbellfield	19
Jones, S. G.	Epsom	13
Jones, W. E.	Sebastopol	46
Jukes, C.	Epping	42
Jukes, W. H.	South Morang	38
Junor, G. M.	South Morang	69
Kane, F. E.	Warrnambool	28
Kell, W. E.	Greensborough	23
Kempton, C. J.	Highton	13
Kerr, J.	Mandurang	7
Kerwin, H. E.	Eaglehawk	21
Kilpatrick, E.	Mernda	69
Kilpatrick, Mrs. E. J.	Campbellfield	42
King, C. W.	Pascoe Vale	45
Kinnersley, F. and Son	Wendouree	19
Kirkwood, S.	Eaglehawk	12
Knight, Bros.	White Hills	42
Knight, G. A.	Sebastopol	29
Knowles, J. T.	Ballarat	3
Lacy, G. C. and Son	Cambrian Hill	32
Lacy, N. C.	Cambrian Hill	13
Langdon, C. W.	Barwon Heads	27
Lanning, W.	Moolap	17
Laskey, A. J.	Yarragon	24
Latta, Mrs. G.	Warrnambool	5
Lawry Bros.	Tandara	113
Lay, P.	Alphington	35
Lee, Mrs. E.	Craigieburn	51
Lehmann, A. H.	Epping	39
Lemin, F.	Waurn Ponds	33
Lethlean, S. J.	Epping	22
Leviston, A. E.	Ballarat East	25
Leviston, G.	Ballarat East	9
Lewis Bros.	Beveridge	58
Lincoln, Mrs. L. M.	Portarlington	58
Littlejohn, E.	Grovedale	22
Lloyd, W. M.	Mickleham	6
Lobb, J. C.	Mickleham	3
Lodington, Mrs. I. E. M.	Ballarat	8
Long, H. S.	Dingee	94
Long, J. D.	Epping	70
Longuehaye Bros.	Point Lonsdale	32
Love, C. C.	Warrnambool	48
Love, J. E.	Strathfieldsaye	16
McAllister, K.	Whittington	36
Mackie, F. K.	Yarragon	63
McConachy, E. T.	Highton	33
McCormack, D.	Woodstock	39
McCormick, T.	Geelong West	24
McCulloch, Mrs. A.	Warrnambool	33
McDonald, F.	Queenscliff	63
McDonald, Mrs. M.	Belmont	14
McDonald, N.	Highton	21
McDonald, R. R.	Mannerim	18
McEncroe Bros.	Bendigo	22
McGregor, W. B.	Mernda	39
McKay, A. B.	Coburg	95
McKay, L.	Kal Kallo	13
McKay, Miss E.	Donnybrook	51
McKay, Mrs. H. E.	Ballarat South	10
McKenzie, D. I.	Marong	95
McLean, J. F.	Bundoora	24
McManus, D. J.	Napoleons	18
McManus, J. W.	Napoleons	18
McMurray, P. J.	South Morang	36
McNabb Bros.	Tullamarine	95
McNally, J. H.	McLeod	4
McPhan, M.	Doreen	55
McPhee, K.	Whittlesea	80
McPherson, E. D.	Upper Plenty	27
McQuarie, J. C.	Mickleham	12
Maddern, R.	Bell Post Hill	50
Mahood, J. E.	Purnim	113
Malcolm, W.	Drysdale	31
Mann, A. T.	Epping	56
Mannes, W.	Strathfieldsaye	39
Martin, Miss A.	Napoleons	21
Martin, Miss G.	Ballarat	11
Martin, W. B.	Ballarat	20
Mashiter, T. R.	Greenvale	60
Maskell, E.	Fyansford	28
Mason, Alfred	Wollert	85
Mason, R.	Donnybrook	60
Mathews, Mrs. E.	Ballarat East	8
Mathieson, A.	Whittington 6	25
Matthey, A. J.	Bannockburn	111
Maxwell, J.	Whittlesea	33
Melling, T.	Kennington	16
Menhennett, F. W.	Sebastopol	21
Mercer, H.	Long Gully	18
Meredith, W. J.	Bundoora	68
Meyer, N. R.	Wallan	70
Millar, Mrs. G.	Smythe's Creek	51
Miller, A. J.	Whittlesea North	37
Miller Bros.	Greensborough	45
Miller, D.	Epping	49
Moller, C.	Wallington	33
Moller, H.	Leopold	38
Moore, R. G.	Moolap	23
Morris, C.	Sebastopol	28
Morris, E. J.	Huntly	19
Mosig, H. C.	Epping	23
Munro, M. J.	Leopold	20
Murfet, Mrs. S.	Huntly	21
Nankervis, L.	Mandurang	15
Nash, A.	Corio	44
Nash, H. A.	Tullamarine	42
Nebel, Mrs. A. E.	Thomastown	39
Nelson, A.	Donnybrook	78

Name.	Address.	Number in Herd at Last Test.
Nelson, D.	Highton	58
Nestor Bros.	Wendouree	40
New, G. H.	Craigieburn	15
Nickols Bros.	Tandara	72
Noonan, J.	Sedgwick	50
Norton, J.	Yarragon	10
Norton, O. G.	Bundoora	40
Notman, J.	Reservoir	68
O'Brien, Miss K.	Heidelberg	68
O'Dell, J. E.	Ballarat East	21
O'Donnell, P.	Wendouree	38
O'Gorman, A.	Craigieburn	67
O'Halloran, J.	Sebastopol	28
O'Hern, T.	Epping	61
Olliver, E. J.	Mickleham	32
Olliver, W.	Campbellfield	86
Olliver, Mrs. S. E.	Ballarat	14
O'Loughlin, W. L.	South Morang	25
O'Neill, E.	Yarragon	54
O'Toole Bros.	Yarragon	107
O'Toole, T. J.	Yarragon	10
Padovan, J.	Yarragon	28
Page, F. J.	Mount Rowan	38
Panozzo, Mrs. C.	Yarragon	92
Parker, Mrs. A. E.	Greensborough	55
Parker, R. H.	Craigieburn	91
Partridge, F.	Harcourt North	29
Pascoe, Mrs. W. J.	Glenroy	2
Patullo, F. E.	Mickleham	31
Payne, A.	Tullamarine	23
Pearcel A. E.	Mandurang	55
Pearce, J.	Mandurang	24
Peck, F. J.	Sydenham	60
Peel, A. L.	Drysdale	16
Pegg, W. E.	East Geelong	6
Pentland, E.	Maiden Gully	8
Pentland, F. C.	Marong	26
Petersen, G.	Reservoir	27
Pettitt Bros.	Geelong	27
Phillips, E.	Mt. Pleasant	22
Phipps, G.	Point Lonsdale	14
Pigdon, B. A.	Waurn Ponds	55
Pilcher, W.	Kangaroo Flat	13
Pitson, R. H.	Yarrambat	20
Pointer, F. A.	Upper Plenty	75
Polly, J. S.	Grovedale	26
Pope, W. R. E.	Whittlesea	19
Port, A.	Moolap	44
Portingale, J.	Campbellfield	33
Power, L. J.	Mernda	58
Putt, Mrs. D.	Bellarine	22
Quinlan Bros.	Epping	48
Rainey, W.	Thomastown	20
Ramage, J.	Mt. Pleasant	28
Rankin, J. W.	Yarragon	43
Rawlings, J. H.	Whittlesea North	37
Rechenberg, J.	Marshall	49
Reddish, Geo.	Coburg	11
Reeves, C. and Son	Sebastopol	19
Reid, Miss B.	Bundoora	74
Renfrey Bros.	Drysdale	11
Renfrey, R. R.	Bellarine	22
Renkin, R.	Ballarat East	11
Reynolds, Misses	Yarragon	15
Richards Bros.	Leopold	56
Richards, T.	Ballarat	29
Richardsi W. J.	Warrenheip	20
Richardson, C.	Curlewis	45
Richardson, D.	Lepoold	23
Richen Bros.	Moolap	47
Ricketts, A.	Mount Duneed	29
Ridsdale, Mrs. M. M.	Yarragon	30
Riley, P.	Curlewis	50
Robinson, J. H.	Fawkner North	42
Robson, Mrs. G. A.	South Morang	52
Rodger, T. B.	Waurn Ponds	26
Rodgers, E.	Whittlesea North	16
Rosewarne, Miss P.	Yan Yean	46
Ross, A.	Lower Templestowe	18
Rowe, Mrs. M.	Eaglehawk	19
Ruff, A.	White Hills	12
Rumpf, D.	Fyansford	13
Salathiel, R. W.	Big Hill	14
Salau, E.	Strathfieldsaye	12
Sandland, A. W.	Bundoora	30
Scarce, F. W.	Sydenham	32
Scheuffele, C.	Epsom	24
Schreenan, E. and Son	Sebastopol	73
Schultz, L. R.	Wollert	37
Scott, C. M.	Diamond Creek	49
Scott, G.	Connewarre	25
Scotti Mrs. J. M.	Whittington	118
Scott, R.	Marshall	97
Seeber, B.	Thomastown	20
Semmens, J. H.	Sedgwick	18
Sewell, J.	South Morang	31
Shankland, I. D.	Greenvale	13
Sharp, Mrs. John	Whittington	31
Shaw-Logan, T.	Glenroy	124
Sheahan, J.	Templestowe	18
Shearer, G.	Warrenheip	18
Shearer, J.	Warrenheip	11
Siebel, F.	Thomastown	29
Simpson, N.	Warragon	35
Slorach, J.	Whittlsea	29
Smirfitt, J. E.	Epping	63
Smith, A.	Fawkner North	10
Smith, F. A.	Invermay	15
Smith, H. H.	Heidelberg	30
Smith, J. R.	Mernda	28
Smith, L. W. W.	Bundoora	73
Smith, R. A.	Epping	35
Smith, S. E.	Epping	27
Smith and Mogensen	Yarragon	100
Sobey Bros.	Napoleons	66
Somerville, A.	Strathfieldsaye	15
Somerville, J.	Strathfieldsaye	14
Somerville, M.	Strathfieldsaye	15
Somerville, P.	Strathfieldsaye	23
Somerville, W.	Strathfieldsaye	48
Southon, H. W.	South Morang	40
Spedding, Mrs. S. A.	Ballarat North	5
Spencer, C. H.	Connewarre	29
Spruzen, G.	Wollert	38
Stacey, H. W.	Connewarre	60
Stacey, R.	Warrenheip	29
Stenning, R., Estate of	Wollert	34
Stephens, H.	Epping	46
Stevenson, E.	Wendouree	35
Stimson, T.	Woodstock	34
Stokes, A. R.	Belmont	14
Story, A. E.	Emu Creek	36
Story, T.	Mandurang	24
Stow, J.	Barwon Heads	16
Stringer, R.	Mickleham	4
Stuart, W. A.	Black Hill	3
Studleigh Estates	Greenvale	115
Suffers, M.	Golden Square	17
Sunderland, W.	Highton	28
Swanton, Mrs. C.	Invermay	00
Symons, Estate of J. C.	Marong	41
Synot, C.	Fyansford	55
Tackaberry, M.	Yarragon	21
Tait, J. M.	Barwon Heads	13
Taylor, W. C.	Ceres	20
Thomas, Mrs. E.	Broadmeadows	10
Thomas, J.	Mandurang	39
Thomas, Mrs. V. E.	Yan Yean	17
Thompson, A. E.	Sebastopol	3
Thompson, H.	Whittington	35
Thompson Bros.	Connewarre	21
Thompson, W. B.	Moolap	93
Thurl, A. E.	Yarragon	34
Toman, Mrs. A.	Golden Square	15
Tomkins, Mrs. E.	Moolap West	19
Toshack, H. J.	Wendouree	38
Towt, C. W.	Glenvale	147
Trahair, R.	Maiden Gully	133
Trethowan, F. W.	Donnybrook	65
Trigg, Mrs. A.	Breakwater	20
Troutbeck, H. B.	Mickleham	39
Tuddenham, F. T.	Cherry Tree	19
Tuddenham, M. J.	Cherry Tree	36
Twigg, G. E.	Tandara	61
Twomey, A.	Greenvale	38
Tyack, N. P.	Marcus	58
Tyrell, H. S.	Highton	29
Tyrell, S. T.	Yarragon	81
Underwood, V. D.	Alphington	13
U'Ren	Campbellfield	41
Vallence, C. A.	Epping	21
Vearing, E.	Epping	6
Vernon Estate	Cherry Tree	46
Vincent, Mrs. A.	Warrenheip	19
Wallace, R.	Breakwater	24
Wall and Faulkner	Marshall	77

 (Continued on page 44.)

Registered Fertilizers

Analyses and Unit Values

Fertilizers Act 1928 (No. 3680).

UNIT VALUES FOR THE YEAR 1946.

	£	s.	d.
Nitrogen, organic, as Blood; Blood and Bone; Blood, Bone, and Flesh; and Bone ..	1	0	0
,, as Nitrate	1	3	2
,, as Ammonia	0	18	0
Phosphoric Acid—			
as Water Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate	0	6	1
as Citrate Soluble in Superphosphate and Mixed and Complete Fertilizers containing Superphosphate	0	6	0
as Citrate Soluble in other Fertilizers	0	5	0
as Citrate Insoluble—			
in Superphosphate	0	3	10
in other Fertilizers	0	5	0
Potash—			
as Sulphate	0	9	3
as Chloride	0	8	0

Melbourne, 3rd December, 1945.

W. R. JEWELL, M.Sc., F.R.I.C.,
Chemist for Agriculture.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946.

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
Nitrogenous—Readily Available. Nitrate of Soda	Sickle in diamond	16·00	..	..	..	..	16·00	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Pivot ..	16·00	..	..	..	..	16·00	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Cresco ..	16·00	..	..	..	..	16·00	..	..	..	..	..	18 10 0	Cresco Fertilizers Ltd., Little Malop-st., Geelong
Sulphate of Ammonia	M.G. Co. in diamond	..	20·59	..	..	..	20·59	..	..	..	..	..	18 10 0	The Metropolitan Gas Co., 196 Flinders-st., Melbourne
,, ,,	Pivot ..	..	20·60	..	..	..	20·60	..	..	..	..	..	18 10 0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond	..	20·60	..	..	..	20·60	..	..	..	..	..	18 10 0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Cresco ..	20·60	..	..	..	..	20·60	..	..	..	..	..	18 10 0	Cresco Fertilizers Ltd., Geelong

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Moderately Available.																
Dried Blood ..	Fitzroy ..	..	..	13·00	..	..	13·00	..	..	..	..	..	13	0	0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
,, ,, ..	T.B. & S. in diamond—Brooklyn	..	..	12·00	..	..	12·00	..	..	..	..	..	12	0	0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
,, ,, ..	T.B. & S. in diamond—Portland	..	..	12·00	..	..	12·00	..	..	..	..	..	12	0	0	Thomas Borthwick and Sons (A/asia) Ltd., 84 William-st., Melbourne
,, ,, ..	M.C.C. in diamond	..	..	12·00	..	..	12·00	..	..	..	..	..	12	0	0	Melbourne City Council, Town Hall, Melbourne
,, ,, ..	Champion ..	..	..	13·00	..	..	13·00	..	..	..	..	..	13	0	0	Sims Cooper (Freezing Works) Pty. Ltd., 31 Queen-st., Melbourne
Blood Manure ..	Pentagon ..	..	..	10·50	..	..	10·50	..	..	..	..	..	10	10	0	Mulgrave By-Products Co., North-road, East Oakleigh
,, ,, ...	Dandy ..	..	..	10·56	..	..	10·56	..	..	..	..	..	10	11	0	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Slowly Available.																
Castor Meal ..	Alba ..	..	..	..	..	..	4·50 (as castor meal)	..	..	2·25	2·25	·75	4	5	0	Lycett Proprietary Ltd., Normanby-rd., Montague
Rape Seed Meal	Alba ..	..	..	..	..	..	5·50 (as rape seed meal)	..	..	1·75	1·75	1·50	5	5	0	Lycett Proprietary Ltd., Normanby-rd., Montague
Flesh, Hoof, and Treated Leather	No. 3 Fertillo	8·00 (As Flesh, Hoof, and Treated Leather)	..	..	..	..	8·00	..	..	..	..	..	8	0	0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
Phosphatic—Readily Available.																
Superphosphate—18 per cent...	Cresco ..	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	Cresco Fertilizers Ltd., Geelong
,, ,, ..	Sickle in diamond	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	Commonwealth Fertilizers and Chemicals Ltd., 84 William-st., Melbourne
,, ,, ..	Pivot ..	..	..	..	..	..	..	14·00	2·50	1·50	18·00	..	5	6	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
17 per cent...	Sickle in diamond	..	..	..	..	..	..	13·00	2·50	1·50	17·00	..	4	19	11	Commonwealth Fertilizers and Chemicals Ltd., 84 William-st., Melbourne
,, ,, ..	Pivot ..	..	..	..	..	..	..	13·00	2·50	1·50	17·00	..	4	19	11	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,, ..	Cresco ..	..	..	..	..	..	..	13·00	2·50	1·50	17·00	..	4	19	11	Cresco Fertilizers Ltd., Geelong
Phosphate—Moderately Available.																
Basic Super. reverted	Sickle in diamond	..	..	..	..	..	..	..	12·10	3·20	15·30	..	6	0	0	Commonwealth Fertilizers and Chemicals Ltd., 84 William-st., Melbourne
,, ,,	Pivot ..	..	..	..	..	..	..	..	12·10	3·20	15·30	..	6	1	3	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Sulphate.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
Potassic—Readily Available.																
Sulphate of Potash	Cresco ..	..	..	..	..	..	..	..	..	..	..	48·50	22	10	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	48·50	22	10	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Sickle in diamond (90%)	..	..	..	..	..	..	..	..	..	..	48·50	22	10	0	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Muriate of Potash	Sickle in diamond (80%)	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20	0	0	,, ,, ,,
,, ,,	Cresco ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20	0	0	Cresco Fertilizers Ltd., Geelong
,, ,,	Pivot ..	..	..	..	..	..	..	..	..	..	..	50·00 (as chloride)	20	0	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
Potash Salts (mainly sulphate)	A.P.C. ..	..	..	..	..	..	..	..	..	..	..	45·00 (unspecified)	22	0	0	Australian Portland Cement Pty. Ltd., 422 Collins-st., Melbourne
MIXED FERTILIZERS.																
Containing Nitrogen and Phosphoric Acid—Readily Available.																
Super. and Ammonia	Cresco (3 and 1)	..	5·00	..	..	..	5·00	10·50	1·80	1·20	13·50	..	9	6	9	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco (6 and 1)	..	2·90	..	..	..	2·90	12·00	2·10	1·30	15·40	..	7	18	0	,, ,, ,,
,, ,,	Pivot II. (3 and 1)	..	5·00	..	..	..	5·00	10·50	1·80	1·20	13·50	..	9	6	9	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Pivot I. (6 and 1)	..	2·90	..	..	..	2·90	12·00	2·10	1·30	15·40	..	7	18	0	,, ,, ,,
,, ,,	Sickle in diamond (3 and 1)	..	5·00	..	..	..	5·00	10·50	1·80	1·20	13·50	..	9	6	9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (6 and 1)	..	2·90	..	..	..	2·90	12·00	2·10	1·30	15·40	..	7	18	0	,, ,, ,,
Nitro Superphosphate	Sickle in diamond	..	1·50	..	..	0·50	2·00	11·60	2·60	1·80	16·00	..	7	15	0	,, ,, ,,
,, ,,	Cresco ..	..	1·50	..	·50	..	2·00	11·60	2·60	2·40	16·60	..	7	15	0	Cresco Fertilizers Ltd., Geelong
Moderately Available.																
Blood, Bone, and Super.	Sickle in diamond	..	..	..	..	2·50	2·50	9·30	4·10	3·40	16·80	..	7	18	6	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
Bone and Super.	Sickle in diamond, No. 1	..	..	..	..	2·00	2·00	8·00	4·20	5·60	17·80	..	7	17	0	,, ,, ,,
,, ,,	Cresco No. 1 ..	..	..	..	2·00	..	2·00	8·00	4·00	6·00	18·00	..	7	17	0	Cresco Fertilizers Ltd., Geelong
Super. and Bone	Cresco No. 2 ..	..	..	..	..	1·00	1·00	11·80	3·10	2·30	17·20	..	7	5	9	,, ,, ,,
,, ,,	Sickle in diamond, No. 2	..	..	..	..	1·00	1·00	11·80	3·10	2·30	17·20	..	7	5	9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*	Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.			
		%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
MIXED FERTILIZERS—*continued.*														
Nitrogen—Slowly Available.														
Flesh, Hoof, and Treated Leather with Bone	Fertillo No. 4	5·55 (As Flesh, Hoof, and Treated Leather)	..	·20 (as bone)	..	..	5·75	..	4·00	6·00	10·00	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
,, ,,	Pannifex's (G)	4·75 (As Flesh, Hoof, and Treated Leather)	..	1·50 (as bone)	..	..	6·25	..	7·25	6·25	13·50	..	9 12 6	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Flesh, Hoof, and Treated Leather with Bone, and with Super.	Fertillo No. 2	5·55	..	·20 (as bone)	..	..	5·75	2·0	2·0	6·0	10·00	..	8 0 0	Glues and By-Products Pty. Ltd., 86 King-st., Melbourne
ANIMAL FERTILIZERS.														
Containing Nitrogen and Phosphoric Acid—Moderately Available.														
Blood and Bone	J. A. Dundas	..	..	..	..	4·50	4·50	..	7·14	13·61	20·75	..	9 13 9	J. A. Dundas, Dynon-rd., Footscray
,, ,,	Corio ..	..	..	..	4·50	..	4·50	..	6·00	8·00	14·00	..	8 0 0	The Corio Trading Co-operative Pty. Ltd., 164 Moorabool-st., Geelong
,, ,,	Fitzroy Special	..	..	..	..	5·00	5·00	..	13·00	5·00	18·00	..	9 10 0	W. Angliss and Co. (Aust.) Pty. Ltd., 42 Bourke-st., Melbourne
,, ,,	Premier ..	..	..	..	..	7·00	7·00	..	6·50	5·50	12·00	..	10 0 0	,, ,, ,,
,, ,,	Murray ..	..	..	..	5·25	..	5·25	..	4·50	7·50	12·00	..	8 5 0	Western and Murray Co-operative Bacon and Meat Packing Co. Ltd., 522 Flinders-lane, Melbourne
,, ,,	Pridham's ..	..	..	..	5·10	..	5·10	..	6·00	8·00	14·00	..	8 10 0	W. Pridham Pty. Ltd., Evans-st., Braybrook
,, ,,	Ibis ..	..	..	..	..	5·25	5·25	..	8·41	6·17	14·58	..	8 18 0	Ficken, Halliday, and McClelland Pty. Ltd., 634 Bourke-st., Melbourne
,, ,,	P.M. ..	..	..	..	..	7·00	7·00	..	6·31	5·69	12·00	..	10 0 0	J. Kitchen and Sons Pty. Ltd., Ingles-st., Port Melbourne
,, ,,	Solo ..	..	..	..	..	7·00	7·00	..	4·25	10·75	15·00	..	10 15 0	,, ,, ,,
,, ,,	Cockatoo ..	..	..	..	..	5·18	5·18	..	10·97	8·00	18·97	..	8 10 0	R. Fordham, Cressy-rd., Camperdown
,, ,,	Echuca ..	..	..	..	..	4·83	4·83	..	8·17	7·65	15·82	..	8 15 9	B. A. Thomas, Echuca

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.						Phosphoric Acid.				Potash as Unspecified.	Price asked per ton.*			Where Obtainable.
		As Nitrate.	As Ammonia.	As Blood.	As Blood and Bone.	As Blood, Bone, and Flesh.	Total.	As Water Soluble.	As Citrate Soluble.	As Citrate Insoluble.	Total.		£	s.	d.	
		%	%	%	%	%	%	%	%	%	%	%				
ANIMAL FERTILIZERS—*continued.*																
Containing Nitrogen and Phosphoric Acid—Moderately Available—continued.																
Blood and Bone	Champion ..	..	..	..	7·00	..	7·00	..	3·50	4·50	8·00	..	9	0	0	Sims, Cooper (Freezing Works) Pty. Ltd., Henty House, 499 Little Collins-st., Melbourne
,, ,,	Champion No. 2	..	..	..	4·75	..	4·75	..	6·00	11·00	17·00	..	9	0	0	,, ,, ,,
,, ,,	Fitzgerald's ..	..	..	..	5·00	..	5·00	..	8·50	6·50	15·00	..	8	15	0	P. Fitzgerald and Sons, Oakleigh
,, ,,	T.B. and S. in diamond (Portland)	..	..	..	6·00	..	6·00	..	7·00	5·00	12·00	..	9	0	0	Thos. Borthwick and Sons (A'asia) Ltd., 84 William-st., Melbourne
,, ,,	T.B. and S. in diamond No. 1 (Brooklyn)	..	..	..	6·00	..	6·00	..	7·00	5·00	12·00	..	9	0	0	,, ,, ,,
,, ,,	T.B. and S. in diamond No. 2 (Brooklyn)	..	..	..	4·50	..	4·50	..	7·00	11·00	18·00	..	9	0	0	,, ,, ,,
,, ,,	Apex	..	..	..	..	4·50	4·50	..	7·00	9·00	16·00	..	8	10	0	North-Eastern Bone Products, Wangaratta
,, ,,	Pannifex's (C)	..	..	..	..	5·00	5·00	..	6·00	8·00	14·00	..	8	10	0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster - terrace, North Melbourne
,, ,,	M.S.C. ..	..	..	..	6·25	..	6·25	..	4·50	6·25	10·75	..	8	18	9	Mildura Shire Council, Mildura
,, ,,	Arch No. 1 ..	..	..	..	7·00	..	7·00	..	7·00	4·00	11·00	..	9	15	0	Victorian Inland Meat Authority, 54 Market-st., Melbourne
,, ,,	Arch No. 2 ..	..	..	..	7·00	..	7·00	..	7·00	4·00	11·00	..	9	15	0	,, ,, ,,
Animal Fertilizer	A and A Surprise	..	..	..	5·50	..	5·50	..	4·00	10·00	14·00	..	9	0	0	G. W. Pennell (dec'd.), Burke-st., Braybrook
Bone Fertilizer	Valley ..	..	..	..	..	6·17	6·17	..	4·81	2·75	7·56	..	8	0	0	Goulburn Valley Freezing Works, Shepparton
COMPLETE FERTILIZERS.																
Containing Nitrogen, Phosphoric Acid, . . and Potash—Readily Available																
Complete Fertilizer	Sickle in diamond (Market Garden) No. 2	..	2·90	..	..	·95	3·85	8·60	3·20	2·50	14·50	2·42	9	18	9	Commonwealth Fertilizers and Chemicals Ltd., 65 William-st., Melbourne
,, ,,	Sickle in diamond (A) (5.1.1.)	..	2·90	..	..	..	2·90	10·00	1·80	1·10	12·90	6·90	10	14	0	,, ,, ,,
,, ,,	Sickle in diamond (C) (4.4.1.)	..	9·15	..	..	..	9·15	6·20	1·10	·70	8·00	5·39	14	5	6	,, ,, ,,
,, ,,	Pivot IV. (5.1.1)	..	2·90	..	..	..	2·90	10·00	1·80	1·10	12·90	6·90 as sulphate	10	14	0	The Phosphate Co-operative Co. of Aust. Ltd., 447 Little Collins-st., Melbourne
,, ,,	Cresco (Market Garden)	..	1·70	..	1·50	..	3·20	8·20	3·20	4·20	15·60	2·42	9	18	9	Cresco Fertilizers Ltd., Geelong
,, ,,	Cresco, No. 2 (4.4.1)	..	9·15	..	..	..	9·15	6·20	1·10	·70	8·00	5·39	14	5	6	,, ,, ,,
,, ,,	Cresco, No. 3 (5.2.1)	..	5·15	..	..	..	5·15	8·75	1·60	·90	11·25	6·06	11	17	0	,, ,, ,,

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1928 (No. 3680) FOR THE YEAR 1946—*continued.*

Bonedust.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition.		Price asked per ton.*	Where Obtainable.
				Fine Bone.	Coarse Bone.		
		%	%	%	%	£ s. d.	
Bonedust ..	Apex ..	3·25	20·00	50·0	50·0	8 5 0	North-Eastern Bone Products, Wangaratta
,, ..	Mount Clear ..	3·00	19·00	50·0	50·0	7 15 0	Bailey Bros., 155 Main-road, Ballarat
,, ..	Pannifex's ..	2·50	26·00	50·0	50·0	9 0 0	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Bone Flour ..	Fertillo ..	1·00	32·50	95·0	5·0	9 2 6	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne
Bonedust ..	T.B. and S. in diamond Brooklyn	2·50	24·0	50·0	50·0	8 10 0	Thos. Borthwick and Sons Aust. Ltd., 84 William-street, Melbourne
,, ..	T.B. and S. in diamond Portland	2·50	24·00	50·0	50·0	8 10 0	,, ,, ,, ,, ,,
,, ..	VIMA ..	4·50	20·00	55·0	45·0	9 10 0	Victorian Inland Meat Authority, 54 Market-street, Melbourne
,, ..	Bendigonian ..	4·00	22·10	50·0	50·0	9 5 6	Bendigo Fertilizer and Wool Co. Pty. Ltd., Charing Cross, Bendigo

* F.O.R. at Melbourne or Railway Station nearest place of manufacture.

Melbourne, 3rd December, 1945.

W. R. JEWELL, M.Sc., F.R.I.C.,
Chemist for Agriculture.

TUBERCLE-FREE HERDS—*continued from page 38.*

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Waller, R.	Ballarat	26	Williams and Berryman ..	Bendigo	15
Walsh, B.	North Geelong	39	Williams, Mrs. N. ..	Tullamarine	10
Walsh, C. J.	Yan Yean	7	Williamson, E. H. ..	Batesford	39
Walton, J. C.	Windermere	28	Williamson, H.	Greenvale	19
Warner, K.	Batesford	33	Williamson, J.	Doncaster (High-street) ..	3
Warren, E. and T. ..	Moolap West	36	Williamson, T. C. ..	Doncaster	79
Warren, S.	Moolap West	26	Willis Bros.	Craigieburn	54
Watkins, F.	Campbellfield	40	Wills, R. G.	North Geelong	23
Watson, Miss M. ..	Napoleons	8	Wilson, J. E.	Diamond Creek ..	11
Wheeler, W. A. ..	South Morang	31	Wilson, J. H.	Eltham	3
Whelpton, B.	Whittlesea North ..	60	Wilson, Mrs. M. ..	South Morang	12
White, A. J.	Yarragon	40	Wirth, Miss M. O. ..	Templestowe	15
White, L. and S. ..	Alfredton	53	Wolter, H. G.	Curlewis	39
White, T. L. R. ..	Alfredton	53	Wood, A. V.	Yan Yean	159
White, W. H.	Ballarat West	17	Wrest, W.	Epping	93
White, W. H.	Smythe's Creek ..	57	Wright, T.	Tullamarine	41
White, W. J.	Alfredton	18	Yann, R.	Wollert	41
Whitelock, E. A. and E. J.	Epsom	23	Young, A.	Queenscliff	18
Whitfield, A. E. ..	Bendigo	6	Young, L. C.	Wollert	28
Whitten, R.	East Preston	74	Young, J. A.	Sedgwick	39
Whittingham, E. W. ..	Greensboroghu ..	33	Young, Mrs. A.	Wollert	34
Wicks, C.	Golden Square ..	18	Young, R. L.	Wollert	26
Wiffin, W.	Bellarine	54	Young, T. F.	Drysdale	27
Wightman, T. A. ..	Ballarat East	11	Young, W. S.	Sedgwick	54
Williams, E. A. ..	Thomastown	35	Zemancheff, V. G. ..	Craigieburn	86
Williamson, A.	Glenroy	58	Ziebell, H.	Thomastown	40

In addition to the above herds, there are 1,640 head of cattle on 273 properties supplying milk to Benalla Wangaratta, Rutherglen, and Yea that have passed two successive negative tests.

There are also 318 herds in which 11,108 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

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232/46.

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FOODS AND FEEDING

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer.

This stack, protected from mice, kept a Mallee farmer's stock going through the 1944-45 drought.

ALTHOUGH the problems of hand-feeding farm animals are not so vital in Victoria as in countries where farm stock have to be housed and totally hand-fed during portions of the year, they become very important throughout the State during lean seasons or periods of drought. Further, in feeding animals for special purposes and on farms in or near cities, where practically no pasture is available, similar problems are experienced.

The following article is presented in the hope that it will assist those interested in feeding farm stock, to make a better selection of the many stock foods available for their particular purpose, and to obtain a proper perspective of the relative food values. A wide range of foodstuffs is dealt with, but the relative monetary values shown do not include freights and other handling charges from the merchant to the feeder. For this reason, the monetary value of home-grown fodders (grain, hay, silage, &c.) may be under-estimated.

As an example of the importance of having available information from which one may calculate the comparative values of stock foods, it may be pointed out that although wheat was quoted at 4s. 3¾d. per bushel f.o.r., Williamstown, during August, 1941, the grower was receiving only approximately 3s. 1d. net per bushel—making 100 lb. wheat containing 8.0 lb. protein equivalent and 72.0 lb. starch equivalent, worth 5s. 2d. The grower buying bran for his stock would have had to pay the fixed price of £6 per ton, plus approximately 15s. freight and other charges, making the total cost £6 15s. per ton on the farm. Thus 100 lb. bran containing 9.9 lb. protein equivalent, and 44 lb. starch equivalent, would cost him 6s. 9d. In this case wheat is 1s. 7d. per 100 lb. cheaper than bran, and, in addition, has a much higher food value, containing 64 per cent. more starch equivalent per 100 lb. than bran, although the protein equivalent is 19 per cent. less.

When the principles of feeding are being discussed, animals frequently are compared with locomotives. Just as the locomotive requires fuel for energy purposes, so does an animal require energy-producing foodstuffs—the fats and carbohydrates. The working parts of a locomotive must be repaired from time to time, and similarly, animals require a tissue-repairing food—the proteins. The minerals and vitamins in an animal's diet can be likened to the lubricating oils so necessary for the smooth running efficiency, and long life of any machine.

The chemical analysis of a food gives a very poor guide to its food value. The chemist is able to determine the amount of dry matter, protein, oil or fat, soluble carbohydrate, fibre, &c., in a food, but he is unable to determine what portion of these constituents is digestible and of use to the animal. The percentage of digestible nutrients in a food is determined by actual feeding experiments. The food is chemically analysed for protein, oil, soluble carbohydrate, and fibre, and is then fed to a test animal. The excreted dung is collected and chemically analysed, and by subtracting the two analyses the percentage of digestible nutrients is obtained.

A portable all-metal hay-rack

Proteins contain 16 per cent. of nitrogen and smaller amounts of phosphorus and sulphur, in addition to carbon, hydrogen, and oxygen. Fats and carbohydrates are derived solely from the latter three elements. Proteins rich in phosphorus are found in large quantities in milk and eggs, while proteins rich in sulphur are most abundant in hair, wool, feathers, hooves, horns, and claws. Lean flesh and muscular tissue are composed almost solely of pure proteins.

The percentage of protein is usually expressed in analyses, as crude protein, and is arrived at by determining the percentage of nitrogen present in the sample and multiplying it by 6·25 (an arbitrary factor agreed upon by chemists as the result of numerous analyses). In many foodstuffs there is nitrogenous material present that is not pure protein. For instance, in roots, such as mangolds and turnips, as little as one-tenth of the digestible nitrogenous compounds is pure protein. In succulent pasturage (grasses and clovers) approximately two-thirds of the digestible nitrogenous compounds is pure protein, and this represents about one-half of the total crude protein content. The latest research workers in animal dietetics have found that the protein value of a food, expressed as the Protein Equivalent (P.E.), is, for all practical purposes, the mean between the percentages of digestible pure protein and of digestible crude protein. In latest tables and feeding charts the protein value of a food is shown in protein equivalents.

The amount of productive energy, that is, the amount of energy available for the production of fat, work, growth, or milk, which an animal is able to assimilate from a food, was first determined about 40 years ago by Dr. Kellner in Germany. Kellner founded the Starch Equivalent (S.E.), the unit which expresses this productive energy value of a food, and which is determined by the increase in live weight resulting from the feeding of 1 lb. pure starch above a maintenance ration.

To arrive at the starch equivalent, test animals are fed certain fixed balanced rations that are maintaining them at certain fixed body weights. Quantities of starch are then added to their rations each day for a certain period, and the increases in body weights, resulting from this added starch, are determined. It has been found that to increase the weight of a store bullock by 1 lb., it takes approximately 4 lb. starch. These test animals are then reverted to their maintenance rations until their weights become steady when they are given another foodstuff, such as bran. To increase the body-weight by 1 lb., it takes approximately 9·1 lb. bran and the starch equivalent of bran works out at 44 lb. [9·1 : 4 as 100 : 44]. In other words 100 lb. bran has a productive energy value equal to 44 lb. starch. The starch equivalents of practically all foodstuffs have been determined, but it must be remembered that there is great variation in different samples. The significance of the term "starch equivalent," may be difficult to grasp, as commercial starch is not usually fed to stock. However, the white floury material in all grain is starch, hence the use of the term.

The gross digestible energy value of a food differs from the starch equivalent (which may be termed the Net Digestible Energy value) in that it expresses the amount of heat that the food is able to produce in an animal's body, and not the productive energy such as the increase in live weight or the amount of animal fat stored up in the body. It is found that 1 lb. of a digestible fat or oil produces as much heat in the body as 2·3 lb. of starch or other digestible carbohydrate (sugars, fibre, &c.), that 1 lb. of pure protein produces as much heat as 1·25 lb. starch, and that digestible nitrogenous substances, not pure protein, as much heat per lb. as 0·6 lb. starch. The gross digestible energy value of oaten hay is determined as shown in Table I.

Sheafed cereal hay protected from the weather is a valuable reserve fodder for horses, cattle and sheep

The gross digestible energy value of 100 lb. oaten hay is equivalent to that of 54·6 lb. starch, but the productive energy value or starch equivalent is only 42 lb. For all practical purposes, the difference represents the cost of digestion, or the energy required for mastication and movement through the digestive tract, and for the secretion of the digestive juices. This energy cost of digestion is not altogether lost to the animal, because much of it is converted into heat and helps to maintain the warmth of the body in cold weather. American feeding standards are based on the "total digestible nutrients," which term is synonymous with gross digestible energy.

TABLE I.—DETERMINATION OF GROSS DIGESTIBLE ENERGY VALUE OF OATEN HAY.

	Digestible Nutrients.		Heat Factor.		Digestible Energy Value.
	%		%		%
Fat	1·8	×	2·3	=	4·1
Pure protein ..	3·3	×	1·25	=	4·2
Other nitrogenous substances ..	0·4	×	0·6	=	0·2
Soluble carbohydrate	31·9	×	1·0	=	31·9
Fibre	14·2	×	1·0	=	14·2
Gross Digestible Energy Value				=	54·6

Foods with a low fibre content, such as animal products and grain, have a low cost of digestion, and the gross digestible energy values are not very much greater than the starch equivalents. On the other hand, fodders with a high fibre content, such as straw, have very high costs of digestion. Although the gross digestible energy value of 100 lb. of good quality oaten straw is equal to that of 41 lb. starch, the starch equivalent is only 21 lb. Similar figures for wheaten straw are 34 lb. and 13 lb. respectively.

Balanced Rations

The Nutritive Ratio is the old form of expressing whether a particular food was balanced or not, according to the function it had to perform. It is the ratio between the percentage of digestible crude protein and the percentage of digestible carbohydrate, plus two and one-half times the percentage of digestible fat in a foodstuff, thus, to determine the Nutritive Ratio of a particular feed add the percentage of digestible carbohydrate to two and a half times the percentage of digestible fat and divide the sum by the percentage of digestible crude protein.

Narrow rations have nutritive ratios of 1 : 5 or less, that is, rations with a relatively high percentage of digestible crude protein. Wide

rations are the reverse and have nutritive ratios of 1 : 9 or higher. A ration with a nutritive ratio of from 1 : 6 to 1 : 8 would be suitable for store, working, or fattening animals. Breeding animals and milking cows require rations with nutritive ratios of 1 : 5 or less.

A more convenient method of determining if a food is balanced is to divide the protein equivalent into the starch equivalent. A balanced ration for breeding animals, milking cows, and laying hens is one in which the starch equivalent is 5 times the protein equivalent. In balanced rations for store, working, or fattening stock, the starch equivalent is 6 to 10 times the protein equivalent.

Larger proportions of protein are required for breeding and milk production, not only because large quantities of protein are transferred by breeding animals to their unborn offspring and by milking animals to their milk, but also because the functions of breeding and milking are associated with the breaking down of much tissue which has to be quickly repaired or replaced. For short periods, an animal can draw upon the protein stored in its muscular tissue to overcome deficiencies in the rations, but this leads to wastage of tissue and loss of vigour and condition.

Some protein-rich feeds are often said to be "heating". Such foods are also rich in carbohydrates and fat, and it is these constituents rather than the protein that causes the "heating"

Vitamins.

In Victoria, where most animals either have access to pasture and other green feed, or receive sufficient fresh fodder, deficiency of vitamins should never occur.

Minerals.

The top-dressing of pastures and the better feeding of stock have helped to eliminate mineral deficiency from the herds and flocks of Victoria. Young stock, breeding animals, and milking cows require more minerals than do working, fattening, or wool-producing animals, but usually there are sufficient minerals in the fodders for their requirements.

Common salt (sodium chloride), which has a very stimulating effect on the appetite, should be the major constituent of all licks used for horses, sheep, and cattle. In licks for pigs and poultry too much salt may be injurious. Common salt can be utilized by an animal in its inorganic form, but animals are apparently unable to store salt in any quantity in their systems. In some districts sufficient salt is available in the water supply.

Calcium phosphate is the mineral used for bone making, and is, therefore, needed more by growing stock and breeding and milking animals. Undoubtedly the most economic method of supplying calcium phosphate to stock is through liberal top-dressing of pastures with superphosphate. The calcium phosphate in the pasturage is in a form that can be readily assimilated by the animal. When temporarily fed on rations deficient in calcium phosphate, milking animals draw calcium phosphate from their bones to produce milk with a full supply of this mineral. Meat meal contains much calcium phosphate and, when meat meal is fed as a protein supplement, it should not be necessary to feed further calcium phosphate.

In Victoria, bone meal usually refers to finely ground bones which contain approximately two-thirds mineral and one-third protein, whereas bone flour usually refers to the ground bones from which the protein has been extracted. Bone flour, therefore, usually contains a larger percentage of calcium phosphate and is more finely ground. Bone meal, bone flour and di-calcic phosphate are interchangeable as far as phosphates are concerned, 2 lb. of bone meal being equal to 1½ lb. of bone flour or 1 lb. of di-calcic phosphate.

Deficiencies of phosphate are more frequently due to protein deficiencies than to mineral phosphate deficiencies and can be corrected by feeding protein-rich foods such as green fodders, lucerne hay, bran, linseed meal, meat meal, and many other concentrates. It is not generally realized that there is a deficiency of lime (calcium) in most concentrates and grain, which should be made good by feeding lime as follows:—For every 100 lb. of grain or concentrate fed to horses, cattle, sheep, and pigs, 3 lb. of the following mineral mixture should be added—4 parts of lime—either ground limestone, chalk, or slaked lime—and 1 part of salt. For poultry, the lime is supplied as shell grit and ½ lb. to 1 lb. of salt is added to every 100 lb. of mash.

Iron is another essential mineral used by the blood for the conveyance of oxygen to the muscular tissue. Iron deficiency is rare, except in the case of milk-fed animals such as sucking pigs which, when affected, can be cured by running on pasture or placing a fresh sod of earth into the pens daily. When this is not possible, each pigling can be dosed with 5 grains of reduced iron on the sixth day after birth.

In certain areas, magnesium (added in the form of Epsom Salts) and iodine (added in the form of potassium iodide) are deficient. These minerals are usually in abundance in most districts of Victoria.

Suitable compound licks can be mixed in the following proportions:—

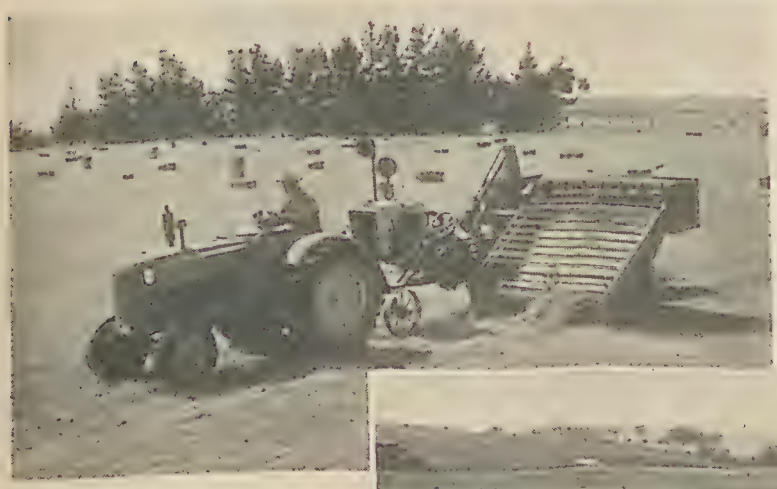
(*a*) *For horses and cattle, where top-dressing is practised, and for sheep under all conditions—*

(i) Common salt only; or

	%
(ii) Common salt	50—80
Lime	50—20

(*b*) *For horses and cattle, where top-dressing is not practised—*

	%
Common salt	50—80
Lime	25—10
Bone meal or di-calcic phosphate)	25—10



Relative Food Values

When estimating the relative food value of a fodder, the two main principles that a feeder has to take into consideration are its *starch equivalent* and its *protein equivalent*. Tables showing percentages of digestible fats, proteins, soluble carbohydrate, fibre, &c., are not altogether necessary, and they make calculations cumbersome.

For all cases of general feeding, the relative value of a fodder can be based almost solely on its starch equivalent, for example:—

(1) The feeding of working, fattening (except pigs), wool-producing, and store animals on ordinary mixed rations.

(2) The supplementary feeding of all animals grazed on green pasturage, green lucerne, young green oats, and other such green fodder crops.

(3) The feeding of store or fattening pigs and calves when ample skim milk is available.

In the absence of green pasturage or other green fodder and clover or lucerne hay, a protein-rich supplementary feed is frequently necessary for balancing the ration. When assessing the value of fodders which have to be purchased under such conditions, the protein equivalent as well as the starch equivalent must be considered.

The capacity of all animals is limited. For instance, a 1000-lb. cow can eat and digest up to 36 lb. ordinary dry feed daily. This represents up to 30-lb. dry matter, 6 lb. being moisture. When hand-feeding heavy milking cows, hard-working horses, and fattening animals that are being topped off, it becomes necessary to replace the coarse and bulky fodders in the ration with grain or other concentrate, otherwise the animals would have eaten their fill before they had consumed sufficient starch equivalents. Pigs and poultry, in particular, have small capacities, and, in addition, they are unable to digest foods with a high fibre content such as hay, chaff, or straw. They, therefore, require green or concentrated foods.

Front and rear views of an automatic pick-up baler

Baled pasture hay is an excellent supplementary food for beef cattle

THE "TON" AND THE "BUSHEL".

The varying weights of the ton and bushel are misleading in the purchase of foodstuffs. Hay, chaff, and greenstuffs are usually quoted by the ton (2,240 lb.), while nearly all by-products—bran, pollard, cakes, and meals—are quoted by the short ton (2,000 lb.), but the short ton is seldom specified. The bushel weights of the more common grains and by-products sold by the bushel are shown in Table II.

TABLE II.—BUSHEL WEIGHTS.

Foodstuff.	Bushel Weight.
	lb.
Wheat	60
Peas	60
Rye	60
Maize	56
Barley	50
Oats	40
Sorghum	40–60
Bran	20
Pollard	20

Foodstuffs and Fodders

PASTURAGE.

Pastures supply the bulk of stock foods in Victoria and their value is inestimable. Without pasture the beef, dairying, wool, mutton, and fat lamb industries would be unprofitable, and, therefore, in all general cases, hand-feeding must be considered as supplementary to pasturage. The importance of pasturage and its value as a stock food is dealt with briefly here. Articles on the improvement and management of pastures have appeared in this Journal from time to time.

Pasturage is the cheapest of animal foodstuffs, and, when properly managed, supplies one of the most nutritious fodders. It is nature's safety food in supplying minerals and vitamins.

Some idea of the cheapness of pasturage can be obtained from the records of the State Research Farm, Werribee, where an acre of pasture yields approximately 20 tons of feed annually, and costs approximately £5 per year to maintain. This maintenance cost includes interest on capital, top-dressing, irrigating, rates, &c. In 20 tons of pasture there are 6,272 lb. of starch equivalents which cost £5. This works out at ·2d. or one-fifth of a penny per pound. The starch equivalents in oaten chaff at £6 12s. 6d. per ton cost 1·7d. per lb., or over eight times dearer at this price than Werribee pasture. In July, 1941, the cheapest purchasable fodders cost fully 1d. per lb. of starch equivalent. To give an example, pollard at £6 per 2,000 lb. was five times more expensive than Werribee pasture. If the protein equivalents of the fodders were taken into consideration also, the comparative values would be even more favourable towards pasture.

Home-grown supplementary fodders, such as hay, silage, root crops, and green fodder crops such as the sorghums, maize, millet, or oats are usually produced at a cost somewhere between those of pasture and the cheapest purchasable fodders.

Under irrigation, where the pastures are not affected by hot, dry weather, green succulent herbage should be available all the year round. Such herbage should have a nutritive ratio of 1 : 2·5, and in the winter months, when supplementary feeding is necessary to carry the full spring, summer, and autumn quotas of stock, practically any fodder can be utilized. In many parts of southern and eastern Victoria, pastures can be compared with those under irrigation for portion of the year. Supplementary feeding on such pastures is relatively simple, except perhaps in late summer when the grass has dried off, and, even with supplementary hay feeding, the dairy stock produce lower and lower milk yields. During this period high production can be maintained only by the feeding of a protein-rich supplementary feed.

Surplus pasture, in the flush of the season, can be harvested for hay or silage and conserved for later use. The nutritive value of pasture hay, and silage is governed by many factors, such as stage at which pasture is cut, kind of weather at harvesting, time allowed to cure, &c. Good quality pasture hay and silage have better feeding values respectively than oaten hay and silage, but these products, through deterioration, may decline to a stage when ultimately they become valueless as fodders.

Lucerne.

Lucerne is grown where pastures of mixed grasses and clovers are less suitable. Lucerne, which grows over a wide range of conditions, makes an excellent and palatable hay, three times as rich in digestible protein as oaten hay. It is a fodder suitable for milk producing and breeding animals.

Oats.

Oats sown early make excellent green feed for milking cows and lambing ewes during the autumn and winter. Oaten hay is the basis of most chaff. Good quality oaten hay or chaff has a food value (starch equivalent) equal to that of bran, although the protein content is less than half. It makes a suitable ration for store and low milk-producing animals, and stock will even fatten on it.

Oaten silage is simple to make and very palatable.

The oat grain is a highly concentrated food and well balanced for working horses, cattle, and breeding ewes. It can be fed in large quantities to all stock, and can be used to displace bran in the ration, 4½-lb. oats being equivalent to 6-lb. bran. Oats are best crushed or coarsely ground for cattle. The husks, on account of their high fibre content, render oat grain less suitable for pig food than other grain. A portion of oats in the grain ration for poultry is recommended.

Oat bran (or branning), a by-product in the preparation of oatmeal, has a food value (starch equivalent) equal to that of bran, but the protein content is lower.

Table III.—Showing Food Value of Pasture, Pasture Constituents, and Pasture Products.

	Digestible Nutrients.				Calculated from Digestible Nutrients.			
			Carbohydrate.					
	Protein.	Fat.	Fibre.	Soluble.	Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio 1:—
	%	%	%	%	per 100 lb.			1:
Pasturage (mixed grass and clover) closely grazed	4·9	·7	2·6	6·8	17	14	4·5	2·3
Pasturage (mixed grass and clover) flowering	2·6	·5	4·6	8·9	17	14	2·2	5·6
Pasture constituents—								
Perennial ryegrass	1·8	·3	4·0	7·4	14	11	1·6	6·7
Cocksfoot	No figures available							
Prairie grass	2·7	·5	4·5	7·1	15	13	2·3	4·8
Alsike clover	2·1	·4	2·2	3·6	9	6	1·8	3·2
Red clover	2·5	·5	3·0	6·3	13	10	2·1	4·0
Strawberry clover	No figures available							
Subterranean clover								
White Dutch clover	2·8	·5	2·6	4·7	11	9	2·4	3·0
Lucerne	3·2	·4	2·9	6·3	13	9	2·5	3·2
Phalaris tuberosa (succulent, closely grazed)	4·1	·3	2·6	6·6	14	11	3·7	2·4
Pasture products—								
Pasture (mostly clover) silage	3·2	·6	3·6	4·4	11	8	2·4	3·0
Mixed grass and clover silage	1·6	·4	3·8	4·9	11	8	1·2	6·0
Lucerne silage	2·5	·4	2·9	7·6	16	11	2·0	4·6
Pasture (mostly clover) hay	6·8	·7	11·9	26·4	48	38	5·8	5·9
Mixed grass and clover hay	3·4	·7	15·0	27·5	48	36	2·9	13·0
Lucerne hay	11·1	·8	9·8	28·4	50	35	8·3	3·6
Red clover hay	8·5	1·7	11·3	26·0	48	38	7·0	4·9
Wimmera rye grass hay	5·5	1·1	12·8	28·5	50	40	4·7	8·0
Perennial rye grass hay	6·8	1·1	11·7	29·3	51	41	5·8	6·4
Phalaris tuberosa hay	1·7	·8	13·7	32·3	50	40	1·5	28·2
Subterranean clover hay	9·4	·8	9·1	27·2	48	38	7·9	4·1

Average samples of oaten chaff and grain produced under Victorian conditions evidently have much lower protein contents than do similar samples produced in England and the United States of America. Since most original tables of analyses of foodstuffs published by this Department have been taken direct from oversea publications, higher protein contents have been shown.

Wheat.

Wheaten hay and shandy (wheaten and oaten) hay are widely used in the lower rainfall areas as fodder for farm horses. These hays are very palatable, are readily eaten, and make a complete ration for horses doing light work, store cattle, &c.

Wheat grain is an excellent stock food, especially for fattening cattle, pigs, and poultry. It should be coarsely ground and mixed well with chaff for horses and cattle. If finely ground and fed heavily, it becomes pasty in the mouth and unpalatable. The feeding of grain in preference to the wheat products—bran and pollard—is favoured during periods of low prices for wheat. Ground wheat can be used to displace pollard in any ration.

Bran and pollard are the most popular concentrate foods used in Victoria. Bran is a balanced, safe, and appetizing food, and can be fed more indiscriminately than most meals without causing disorder. On the other hand, due to excess carbohydrate, pollard, and crushed wheat and barley, if fed heavily, may cause food sickness in horses and cattle with loss of appetite. Bran is an excellent food for working horses, dairy cows, and breeding stock, including sows. Pollard and crushed wheat are more suitable for fattening animals, but can be fed with advantage to all classes of stock as a supplement to green pasturage, or with other protein-rich food. Bran and pollard are the principal constituents used in the mash for poultry.

Horses, sheep and cattle can be fed wheat to partly replace such fodders as chaff, bran, pollard, barley, maize and oats. Pigs, poultry, and even dogs, can be fed wheat to replace bran, pollard and other grain. For the displacement of chaff in the ration, 3 lb. of wheat is equivalent to 5 lb. of chaff, and, for horses, sheep and cattle, a proportion of the chaff can be displaced by wheat in that ratio. Except for sheep and poultry, wheat should always be ground before feeding to farm animals. If it is intended to change the rations so that they contain a large proportion of wheat grain, the changes should be gradual, and spread over a period of at least a week. If possible, sudden changes in the rations should be avoided.

Barley.

Barley makes a very palatable green fodder crop with a high food value. The crop can also be made into good silage, but, because of the awns, barley hay is not favoured in this country.

The high food value and palatability of barley grain as a food for cattle, horses, and pigs are well known to farmers. Ground barley can be used to replace ground wheat or pollard in the ration.

By-products coming from barley are brewers' and distillers' grains, malt coombs, and barley bran. Wet brewers' and distillers' grains are

Table IV.—Showing Digestible Nutrients and Food Value of Oaten Fodders. (Victorian figures).

—	Digestible Nutrients.				Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	Protein.	Fat.	Carbohydrate. Fibre.	Carbohydrate. Soluble.				
	%	%	%	%		per 100 lb.		1 :
Oats, green, grass stage	2·1	·4	1·9	6·1	11	9	2·0	4·3
Oats, green flowering	1·4	·4	4·9	6·5	14	10	1·1	8·9
Oaten hay	3·7	1·8	14·2	31·9	55	42	3·5	13·7
Oaten silage	1·2	·5	5·2	8·7	17	12	·9	12·6
Oaten straw	·7	·5	17·6	22·1	41	21	·6	58·4
Oat hulls or husks	·5	·1	18·7	21·6	41	21	·4	81·2
Oat grain	8·0	4·9	2·6	46·2	69	62	7·6	7·6
Oat bran or branning	4·8	2·8	6·2	37·6	56	48	4·6	10·2
Oat pollard	9·0	6·8	3·2	39·2	69	62	8·6	6·4
Oat screenings	6·2	4·6	5·0	35·0	58	50	5·9	8·2

[*Continued on page 78.*

PARASITES OF THE HORSE

By G. NICOL, B.V.Sc., Veterinary Officer

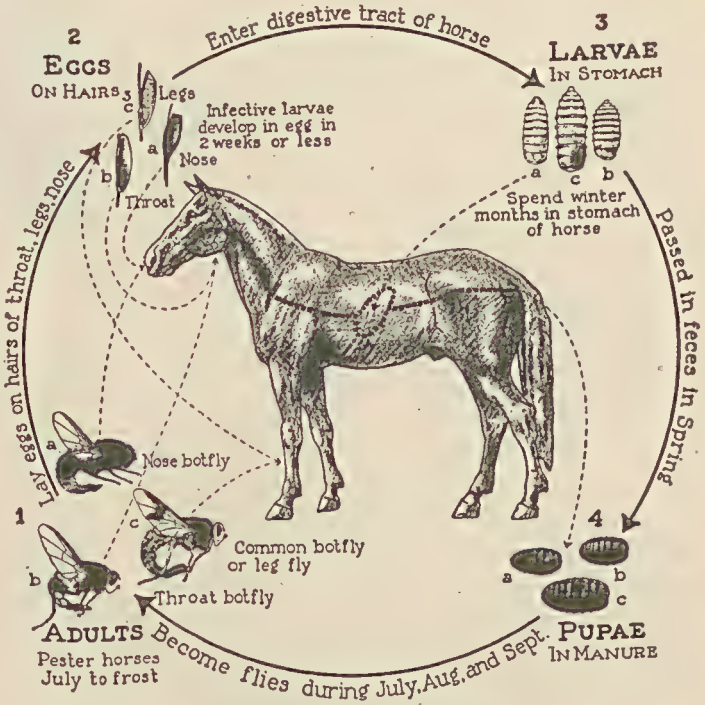
THE internal parasites of horses in Victoria include bots, stomach worms, tapeworms and roundworms while the external parasites comprise lice and mange mites.

Internal Parasites

Bots.—These are the larval forms of the bot-fly which is a brown hairy fly somewhat resembling a bee, but having one pair of wings only. The commonest species (*Gastrophilus equi*) lays its bright yellow eggs anywhere on the body. These hatch out in 5 to 10 days, and are carried by the horse's lips to the mouth where they burrow into the surface tissue of the tongue. After remaining in the tongue for 21 to 28 days, they are swallowed and become attached to the stomach wall.

Bots rarely cause death but may be a source of trouble in any of the following ways :—

(i) Annoyance caused to horses by the adult fly during the process of egg laying.



Life History of the bot-fly.
[*After Univ. of Illinois, circular* 496]

Bots adhering to stomach-wall of the horse
[*After Univ. of Illinois, circ.* 496]

(ii) Accumulation of the larvae about the entrance of the stomach into the small intestine, so causing interference with the action of the muscle tissue at that point, and also blocking the passage of the food.

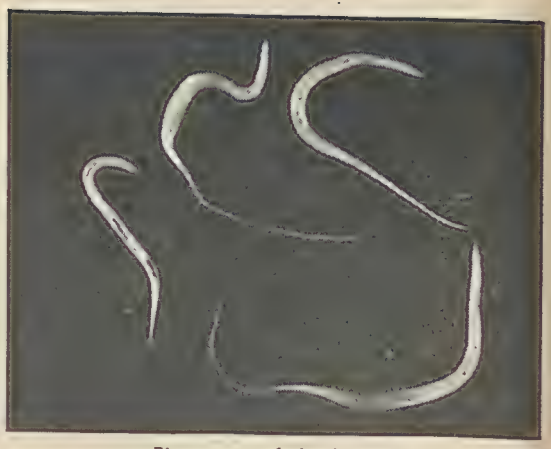
(iii) Injury to the mucous membrane of the stomach to which the larvae are attached.

Treatment.—The eggs may be removed from the horse's coat by frequent grooming, preferably with a ½ per cent. lysol solution which aids hatching of the eggs not removed and destruction of the freshly hatched larvae. Where a heavy infestation occurs, horses should be clipped and the hair burnt. The larvae

may be removed from the stomach by a treatment involving the use of a stomach tube, which requires the attention of a veterinary surgeon. This treatment involves the use of a sodium bicarbonate solution followed by carbon bisulphide both of which are administered through the stomach tube.

Carbon bi-sulphide may also be given as a ball, the dose being 6 drachms for a horse of 1000 lb. weight. The drug which is volatile is given in a gelatine capsule, and great care must be taken when balling the horse to avoid breaking the capsule. Food or water should not be given the horse for at least four hours afterwards, and on no account should carbon bisulphide be followed by a purgative; oil especially is dangerous.

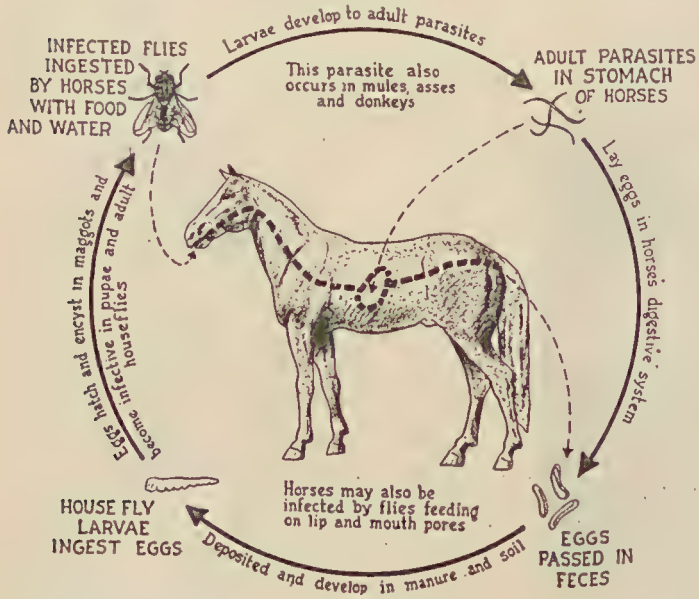
Small Round Worms.—The small round stomach worms are of the species *Habronema* and *Draschia* and are about ¼ to ¾ inch in length. They may occur free within the stomach or within nodules in the stomach wall. The larvae of the parasites are passed out in the faeces and later are swallowed by house or stable fly maggots in which they develop. It is within the maggots of these flies that the larvae reach the infective stage. Ingestion of flies or fly maggots liberates the larvae which grow to maturity in the horse's stomach. Conditions such as "Granular Dermatitis" "Summer Sores" and "Swamp Cancer" are associated with the larvae of these parasites. The large stomach tumours may break down with consequent rupture of the stomach. Splenic abscesses and eye tumours may also be a source of trouble due to these parasites, so that their economic importance cannot be overlooked.



Pin worm of the horse.
[*After Univ. of Illinois, circ.* 496]

Treatment.—As for bots.

Pin Worms.—The pin worm (*Oxyuris equi*) occurs in the large intestine of the horse. It may be readily differentiated from the other round worms of horses by the shape of the mature female which has a long narrow tail. The eggs are laid in clusters about the anus making a sticky mass which causes intense irritation. The eggs drop off after about three days and are ingested with food and water.


INFECTED FLIES INGESTED BY HORSES WITH FOOD AND WATER
Larvae develop to adult parasites
This parasite also occurs in mules, asses and donkeys
ADULT PARASITES IN STOMACH OF HORSES
Lay eggs in horse's digestive system
EGGS PASSED IN FECES
Deposited and develop in manure and soil
HOUSE FLY LARVAE INGEST EGGS
Horses may also be infected by flies feeding on lip and mouth pores
Eggs hatch and encyst in maggots and become infective in pupae and adult houseflies

Life history of a stomach worm of horses (*Habronema muscae*).
[*After Univ. of Illinois, Circ.* 496]

Treatment.—First starve the animal for 36 hours and then dose with oil of chenopodium at the rate of ½ oz. per 1000 lb. live weight, with liquid paraffin, 4 to 6 oz. plus castor oil 1 pint. Where oil of chenopodium is not available, oil of turpentine (rectified) at the rate of 2 oz. per 1000 lb. live weight may be used and should be followed by a purgative. To remove the mature females, an enema of concentrated quassia infusion in soapy water is given. To relieve the itching about the tail, mercuric or carbolic ointment should be applied. In addition the stable should be thoroughly cleaned and fresh bedding supplied at short intervals.

Large Round Worms.—The large round worm of the horse (*Ascaris equorum*) varies from 8 to 16 inches in length. It passes part of its life cycle

in the lungs, setting up lung irritation with consequent cough and bronchial catarrh. Foals especially suffer from this parasite. They may become unthrifty and harsh in the coat with digestive disturbances and colic.

Treatment.—Carbon bisulphide and carbon tetrachloride have been used with some success, but preferred treatment is that with phenothiazine which can be administered in the feed, dose rates being :—

Draught Horses	1 oz.
Light Draughts and Saddle Horses	¾ oz.
Yearlings and Ponies	½ oz.

The total dose above is divided into four equal parts and one part is given for each of four days. Bran mashes should be fed before, during and after treatment unless the horses are on green feed. Horses should be spelled after treatment for about five days. All horses in a mob should be treated and after treatment run in a fresh paddock.

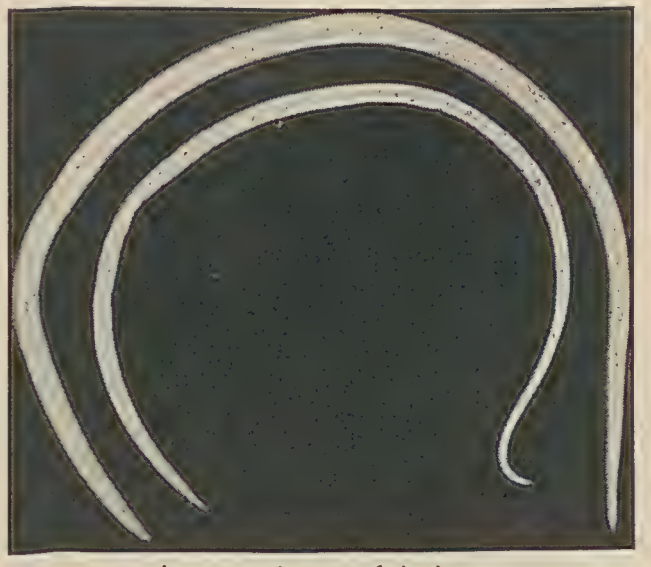
Strongyles or Blood Worms are a species of round worms which have a particularly damaging effect on horses; the animals lose condition, become harsh in the coat and show signs of intestinal disturbance such as colic or diarrhoea. Young horses in particular suffer. Anaemia develops and may become marked with dropsical swellings on the abdomen and legs while death occurs in severe cases.

Frequent temporary attacks of colic in horses are often associated with blockage or thrombosis of the mesenteric arteries, due to inflammation and parasitic swellings caused by the strongyle larvae. The condition often sets in suddenly with symptoms of colic without any relationship to feeding or external circumstances. Horses may simply be restless in mild attacks or may violently roll and throw themselves about in great pain. Examination through the wall of the rectum may reveal a pulsating dilatation of the anterior mesenteric artery without any abnormality of the intestines themeslves. Mild forms usually end in recovery while severe forms may end fatally.

Tapeworms are relatively unimportant in horses. They are mostly found in the small intestine, but occasionally in the stomach. Treatment can be effected with Kamala or with turpentine plus extract of male fern and linseed oil though this is seldom necessary.

Prevention of Worm Infestation.—Avoidance of overstocking will help considerably in keeping contamination of pastures at a minimum. The use of non-susceptible stock in conjunction with rotational grazing is effected by grazing cattle or sheep alternately with horses, cattle and sheep not being susceptible to the majority of the horse parasites. When dealing with heavily contaminated pastures, it may be necessary to plough and lime and then allow land to lie fallow. Adequate feeding of horses is a pre-requisite as poorly fed stock have a low resistance to worm infestation; in addition where pasture is short, more larvae and eggs will be ingested. Proper disposal of manure heaps aids by breaking the life cycle of those parasites which depend for part of their existence on passage through flies, &c. Where anaemia is a feature, incorporation of iron in licks is useful provided other recommendations are followed. Treatment with correct medicaments is necessary as there is no universal worm drench for all parasites.

Submission of Specimens.—As the type of parasitic infestation can often be determined by microscopic examination of faeces and as it is necessary to determine the type of infestation before control measures can be indicated, it is recommended that a sample of faeces should be submitted from suspected cases to the Director, Veterinary Research Institute, Story-street, Parkville, N.2., for examination.



Large round worm of the horse
[*After Univ. of Illinois, Circ.* 496]

External Parasites

Lice.—Horses may be infested with either biting or sucking lice. The sucking louse (*Haematopinus asini*) has a long pointed head, while the biting louse (*Bovicola equi*) has a short blunt rounded head. In general, the sucking louse does more damage than the biting louse, and is more difficult to eradicate. Infection is spread mainly by close contact of affected and unaffected animals, but curry-combs, brushes, &c., may carry the lice directly from one horse to another.

Treatment.—The best method of treatment is to clip the affected areas and dress with a 1 per cent. carbolic acid solution, or a 0·06 per cent. solution of nicotine sulphate. Failing these, kerosene emulsion, made by dissolving 1 lb. of soft soap in 1 gallon of hot water, and adding 1 pint of kerosene to the solution as it cools, is very effective. As the eggs are not destroyed by the treatment, two treatments at an interval of fourteen days in warm weather and three treatments at intervals of 20 days in cold weather should be given. Most oils are unsuitable for treatment of lice in horses as they tend to remove the hair where they are applied.

Mange Mites.—The common mange infection which is found in horses is that associated with the mange mite known as *Chorioptes equi*. Infested horses will be found to rub their feet and legs against fences. Microscopic examination of skin scrapings is necessary to detect the mange mite responsible. Another mange mite of horse, *Psoroptes hippotis*, is responsible for lesions about the ears and is found in Queensland, although not apparently responsible for any serious infestation.

Treatment.—The hair must first be clipped from affected areas before soaking the feet in a lime sulphur wash. This should be repeated on four occasions at seven day intervals. At the same time the stable should be properly cleaned and sprayed with the lime sulphur and curry combs and brushes disinfected.

BRACKEN FERN POISONING

A considerable number of farm live stock die in Victoria each year as the result of eating poisonous plants. Of such plants bracken fern is one of the worst offenders. This may surprise many stock owners, because there are properties on which bracken grows profusely, but where there have been no losses. In Victoria cattle only are known to be affected. Various reasons have been advanced why losses do not occur on all properties where bracken grows. Seasonal conditions and the type of feeding adopted may encourage cattle to eat bracken. The plant may not be poisonous at all times, but this is not known for certain, while the actual substance responsible for the poisoning has not been identified. The symptoms tend to be somewhat indefinite. As a rule the animal gradually goes off its feed, loses condition, and shows some outward sign of the haemorrhages which occur within the body. There may be a blood stained nasal discharge, droppings or urine. Cattle of all ages may be affected, but mostly calves are the sufferers. Calves seem to be more ready to eat the ferns, particularly young fronds, than adult cattle. This especially is the case when feeding and management are poor. Calves may sometimes be seen actually seeking out ferns and eating them greedily, although probably such a perverted taste would not develop rapidly. On some properties it may be difficult to keep the cows away from bracken, but this should be easier with calves, and as a means of prevention, should be done wherever possible.

There is no known medicinal treatment for affected animals. The ulcerated condition of the bowel would indicate that purgatives are dangerous. It is believed that a large amount of the bracken has to be eaten before symptoms appear, and the comparatively slow onset of the ailment suggests that if cases are noticed at the first sign of trouble, the animals may recover if isolated from the bracken.

[Contributed by the Live Stock Division].

LIVE STOCK NOTES

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

WHENEVER a new herd sire is selected, the farmer's net income and life-time production per cow of the future herd are at stake. This point is made by S. A. Williams, Extension Dairyman, Purdue University, U.S.A., in an article contributed to the *Country Gentleman*, an American publication.

The writer gives four pre-requisites to success in establishing a profitable dairy herd :—

1. Feed capacity and dairy temperament in the cows ;
2. Longevity ;
3. Persistent yield ; and
4. Regular calving.

Although the article was written for American readers, these points apply equally well under Victorian conditions.

The high producing cow must have the capacity to consume large amounts of feed and convert them into milk instead of putting them into flesh and fat. This characteristic is dependent on certain glands in the cow's body and can be measured only by herd testing. There are no external indications of conformation which give any definite assurance of how much milk a cow is capable of giving during her lifetime.

The length of time a cow remains in the herd is important, because the offspring of a cow which has proved her worth command higher prices than if her breeding and producing ability have not been determined. Also, as long as the cow remains a profitable producer, it is not necessary to replace her with another animal. This reduces replacement costs. In America, it is estimated that the cost of raising a heifer calf from birth until she drops her first calf usually amounts to a sum equal to the income over feed cost during her first two lactations. A cow is thus four years old before she has returned the cost of rearing and is ready to return a net income to her owner. Consequently, one cow retained in a herd until ten years of age, other things being equal, is as valuable as three other cows leaving the herd as six-year-olds.

Persistent yield is a low rate of decrease from month to month. It accounts in a large measure for the difference between high producers and moderate ones. High daily production during the first month of the lactation is desirable, but cows which sustain high production during the sixth, seventh, and eighth months, while they are most desirable members of the herd should not be exploited to the extent that they may fail to receive a rest period of six to ten weeks, which is essential for high production.

Some cows are regular breeders, conceiving with only one service, while other cows get in calf only after several services. The most profitable cow is the one that makes a good record and produces a living calf every twelve months. One month's production just after calving is usually worth two or three months' milk yield after a cow has milked for twelve months.

Pea-vine Silage

Large areas of peas are now grown for canning, and with modern machinery, the green peas are mown in the field and carted direct to the canning factories where they are vined. The haulms and empty pods are then available for feeding direct to dairy cows, other cattle, and sheep, as pea-vines or for conversion to pea-vine silage.

When properly made, pea-vine silage has twice the food value of sugar-beet pulp silage. It is an extremely valuable fodder for supplying protein and other nutrients to dairy cows, being equal in food value to good, mixed pasture silage.

Pea-vine silage is said to have a strong odour, nevertheless, it is relished by all classes of cattle and sheep. It is not desirable to feed the silage in the cow shed, but, if fed to milking cows in

the paddock immediately after milking, it should not taint the milk—an important factor where whole milk is sold direct for human consumption.

The silage can be made in the same way as sugar-beet pulp or other silage, but the green material would be collected at the canning factory. Where the older method of lifting the pea plants, roots and all out of the ground, is practised, dirt adheres to the roots, making a gritty, less palatable fodder. Digestive troubles may occur in stock consuming vines or silage gathered in this way, therefore factory owners and farmers contracting to take the vines from the factories should discard earthy samples.

Use Meatmeal for Pigs Sparingly

Pig raisers who feed their pigs largely on cereal meals and do not use separated milk, but in its place feed meatmeal, are having a difficult time now because the supply of meat-meal is short of requirements. Some hints on making the best use of available meat-meal are therefore offered.

Meat-meal is a by-product of meat works, and reduced stock slaughterings have caused a serious shortage of meat-meal. Under normal conditions, in the absence of separated milk, the most economical results are obtained by feeding ¼ lb. of meat-meal daily to each pig, irrespective of size, from the time it is weaned until it becomes a baconer. This rate of feeding is approximately equivalent to adding 5 lb. of meat-meal to each 100 lb. of cereal meals in a self-fed mixture.

When there is not sufficient meat-meal to supply that allowance it should be realized that the first ounce of meat-meal in the pig's daily ration gives better results than each additional ounce. Also, young pigs require the meat-meal more than older pigs.

Savings of meat-meal may be effected by eliminating it from the diet of fattening pigs during the last two weeks before they are marketed.

The ill-effects of insufficient meat-meal in the diet of pigs will be lessened if the pigs have an abundance of green food or good quality hay or chaff, preferably lucerne or clover. Linseed-meal when available, may well replace half the meat-meal requirements of pigs. For economic reasons, meat-meal should not be fed to pigs which receive ½ gallon or more of separated milk each daily. Half a gallon of separated milk gives better results than ¼ lb. of meat-meal.

—[L. A. Downey, H.D.A., Pig Expert.]

Poultry Notes

As pullets approach egg production, they should receive careful treatment to prepare them for high egg production over a long period. Carelessness in feeding and an unsuitable environment would undoubtedly reduce production.

It is advisable to grade pullets into groups of uniform size. Under these conditions they are more contented, and develop better.

A continuous supply of tender green food should be fed every day, and sufficient of the different varieties of green fodder should be planted for use throughout the year.

During February and March cull and market all pullets likely to be unprofitable. Examine cockerels for faults, such as weak combs, crooked breasts, and underweight, and only keep the best for breeding purposes.

Beginners may think it necessary to cull pullets heavily during their first year of egg production, but this is not always a wise practice as pullets, bred from good quality laying stock, well reared, and kept in good health, do not require much culling. It is only the obviously unfit birds that should be eliminated from the flock.

When culling, it should be remembered that pullets of the same age do not always commence laying at the same time, and, therefore, there is considerable variation in the width of the pelvic bones and softness of the abdomen, up to the time of maximum egg production. The cost of replacement is high and every bird culled unnecessarily is a serious loss to the poultry farmer.

To secure uniform superiority amongst the birds, breeders must carry on the selection of breeding stock for generations. If birds with desirable qualities are selected, it should not be expected that all their progeny will have those desirable qualities, but a larger proportion will be obtained than when no selection is made at all.

—[H. F. Clinton, Poultry Expert.]

Bee-keeping

With the exception of Eastern Gippsland and parts of the north-eastern river valleys, bee-keepers have had a lean time and migratory bee-owners are looking forward to the iron bark and grey box which are now showing bud. The red iron bark, (*Eucalyptus sideroxylon*) should bloom during this month, but sites are already fully booked out in the vicinity of forests where

[*Continued on page 60*

BOTULISM in Ducks and Geese

By G. NICOL, B.V.Sc.,
Veterinary Officer

BOTULISM or limberneck is a disease of ducks, fowls and geese associated with the ingestion of a toxin which often develops in decomposing organic matter such as decaying plant material, animal carcasses, or contaminated food. The organism responsible for the production of the toxin, "*Clostridium botulinum*," Type C, is a normal inhabitant of the surface layers of the soil and may also be present in the alimentary tract of animals but does not multiply in this latter site. Where conditions are suitable for its growth, as in decaying plant materials, however, it multiplies with the production of a water soluble toxin (Botulinus toxin). On ingestion this toxin is absorbed through the alimentary tract mucosa and exerts its characteristic action on the nervous system with symptoms of paralysis, muscular weakness and depression.

Left and right.—A goose affected with botulism. The effects of the poison on the bird's movements are clearly indicated. Lower.—Ducks affected with botulism

Symptoms in Ducks and Geese

Epidemics of botulism have been recorded among wild birds in many countries. Fowls, ducks, and geese are all susceptible. In ducks and geese loss of appetite with food often left untouched in troughs may give an initial indication of the trouble. Partial or complete paralysis of the muscles of the neck, wings and legs is evident. The head is usually held in contact with the ground and in movement the wings are often partially extended. On being disturbed affected birds may roll over or make attempts to retain balance by placing beak and wing tips on the ground. Diarrhoea and also loss of voice are prominent symptoms. Eye reflexes are unresponsive or elicited with difficulty. Birds may be in good condition or in poor condition depending on the length of time over which they have been affected, the amount of toxin ingested and the degree of paralysis of the mouth and throat muscles. The severity of symptoms and time taken for their development depend on the resistance of individual birds and the quantity of toxin ingested.

Post-mortem findings: As the organism of botulism does not invade the body tissues it is natural that no lesions, visible to the naked eye, are found in affected birds, in the viscera or skeletal system. Post-mortem findings are consistent with the action of a powerful toxin. In this connexion it is worthy of note that 1/100,000th part of 1ml. of the toxin is sufficient to kill a normal sized mouse so that it can be readily appreciated that care has to be exercised in preventing access of birds to any solution of the toxin such as occurs in drainage waters from an infected farm.

Diagnosis is largely based on clinical evidence and history and may be confirmed by bacteriological and serological tests conducted in the laboratory with guinea pigs and mice.

Prevention and Treatment: Prevention is strictly a matter of sanitation and good husbandry. Badly drained poultry farms with wet pens or yards containing any rotting material are always likely to remain a persistent source of trouble. Exposure of the toxin to direct sunlight will destroy it, but penetration of the sun's rays to individual pens can be adequately effected only by having pens thoroughly cleaned of any decaying material and carrying out efficient drainage. Yards which have become saturated with water due to faulty drainage and have become contaminated with the toxin cannot be efficiently treated in a short time. Under such circumstances birds should be removed to higher ground or to fresh land and stock kept off the previous land until it has been thoroughly drained, ploughed and exposed to sunlight over a long period. Since the droppings of affected birds contain the toxin, sick birds should be isolated and their droppings removed to an inaccessible spot. The same remarks apply to the carcasses of dead birds which are a source of danger and should be destroyed by burning.

Some little work has been done to date on treatment of affected birds, but further work is necessary before a reliable indication can be given of the effectiveness of this treatment against the disease.

LIVE STOCK NOTES (*continued from page 58*)

these trees predominate. Red iron bark is noted for the profusion of nectar secretion and also unfortunately, lack of pollen. Pollen is not only essential for the rearing of young bees, it is also necessary as a nitrogenous food for the adult bee during the conversion of nectar into honey. Consequently, unless pollen is available from some other source breeding is reduced to a minimum and while storing honey from this source adult bees rapidly wear out, reducing strong colonies to the strength of nuclei in a few weeks.

Manna gum, (*Eucalyptus viminalis*) while usually sparse in the secretion of nectar, yields a fair amount of pollen and blooms during the same period as the red iron bark. These species are rarely found together mainly because no encouragement has been given to far-seeing individuals to establish plantations of manna gum in the vicinity of red iron bark forests. Possibly in the future honey production will receive more consideration and forests will be scientifically planned for honey, as well as timber production, thus reducing the worry and long-travelling of bee-keepers and considerably increasing the production of first-grade honey.

[J. W. Thomlinson, Apiary Inspector.]

Seed Certification in Victoria

List of Growers and Registered Areas Approved for 1945-46 Season

SEED certification schemes are in operation in Victoria in respect to the following species and strains of pasture seeds :—

1. Victorian Perennial Rye Grass.
2. Tallarook "Late Flowering" Subterranean Clover.
3. Bacchus Marsh "Early Flowering" Subterranean Clover.
4. Victorian Phalaris tuberosa.
5. Victorian Irrigation White Clover.

Growers approved for the 1945–46 season are as follow :—

1. Victorian Perennial Rye Grass.

R.G.— 1. Pickford, A., Clunes.
2. Pickford, H., Clunes.
6. Toose, H., Smeaton.
9. Troup, G. C., Tourello.
10. Sewell, A. and J., Kooroocheang.
17. Thomas, G. T., Ascot.
20. Pickford, J., Clunes.
22. Williams, A., Smeaton.
24. Evans, J., Smeaton.
27. McCrum, J., Smeaton.
31. Sewell Bros., A. J., and D. H., Smeaton.
43. Carter, J. R., Estate of, Clunes.
46. Cosgrave Bros., Smeaton.
47. Bunn, J. and Sons, Allendale.
50. Cook, W., Clunes.
53. Griffin, J. M., Coghills Creek.
54. Hives, J. H., Kingston.
59. Armstrong, J. R., Allendale.
62. Spittle, S. G., Estate of, Ascot.
69. McLennan, A. C., Clunes.
70. Slattery, J. P., Bald Hills via Ballarat.
71. Holmes, H. S., Ascot.
72. Ford, E. H., Tourello.
74. Redman Bros., Smeaton.
78. Baird, D., Blowhard.
80. Grills, J. C., Blowhard.
86. McColl, A., Miners Rest.
98. White, W. W., Cardigan.
99. White, R. T., Cardigan.
102. Higgins, F., Irrewarra.
106. Saddlier, E., Warncoort.
107. England, S. C., Warncoort.
108. England, W. G., Estate of, Warncoort.
R.G.–109. Hay, John, Colac.
112. Hawtin, F., Colac West.
116. Kenny, P., Cororooke.
118. Martin, H. L., Irrewarra.
119. Menzel, C., Armytage.
120. Menzel, R. K., Armytage.
125. Roache, J., Nalangil.
126. Roache, P., Nalangil.
128. Ryan, D. A., Nalangil P.B., Colac.
133. Rankin, A., Colac.
138. McCready, D., Ondit.
140. Dignan, A., Warncoort.
141. Hughes, A., Larpent P.B., Colac.
142. McDonald, J. J. and Sons, Birregurra.
147. Mackay, D. G., Irrewarra.
148. Middleton, A. H., Nalangil.
154. Smith, S., Colac West.
155. Vagg, E. L. and Son, Larpent P.B., Colac.
158. Spalding, J. A., Larpent P.B., Colac.
160. Billing, F., Colac.
166. Ingles, A. D. C., Larpent P.B., Colac.
167. Speirs, F., Nalangil P.B., Colac.
168. Pekin, D., Larpent P.B., Colac.
169. Collins, G. J., Irrewarra.
172. Conheady, J., Nalangil.
178. Buckle, W., Colac West.
181. Gubbins, N., Birregurra.
194. Swayn, H. J., Nalangil P.B., Colac.
199. Ryan, H. L., Irrewarra.
200. Elbourne, A. J., Irrewarra.
201. Bolton, M., Malmsbury.
202. Ward, A. H. and N., Box 31, Kyneton.
206. Hutcheson, S. G., Kyneton.
208. Keegan Bros., Kyneton.
213. Thomson, R. H., Kyneton.
216. Harper, J., Lauriston.
218. McPherson, A. L. and J. J., Mt. St. Mary, Kyneton.
224. Portwine, E. C., Lauriston.
225. Trewhella, A. B., Newham.
227. Rollinson Bros., Green Hills.
231. O'Donnel, J., Kyneton.
236. Coiles, J. F., Kyneton.
237. Brown, M. T., West Kyneton.
238. Carroll, H., Kyneton.
241. Donnelly Bros., Kyneton.
242. Wise, D. F., Healesville-road, Coldstream.
251. Buchholz, L. G., Lismore.
258. Moloney, P. G., Kolora.
259. Moloney, D., Kolora.
267. Murnane, Jas., Terang.
293. Heffernan, Terang.
294. Nalder, H. S., Timboon.
295. Hay, J., Gnotuk via Camperdown.

R.G.–296. Huf, P., Croxton, E., via Hamilton.
298. Hermann, O. G., Croxton E., via Hamilton.
306. Walton, W. A., Burrumbeet.
311. Ritchie, J. F., Tourello.
316. Greenwell, W. J., Allendale.
318. Tennant, S., Lawrence.
320. Mezzeni, W., Kooroocheang.
331. McRae, C., Tourello.
332. Nicholls, P. L., Kooroocheang.
333. Charleson, J., Kooroocheang.
334. Kirk Bros., Ross Creek.
335. Nicol, F. H., Ross Creek.
336. White, L. and S., Alfredton.
337. Hurn Bros., Kingston.
338. Mason, R., Ascot.
339. Lange, F. J., Learmouth.
340. May, H., Dean.
341. Leishman, A. J., Kingston.
342. Donovan, J., Learmouth.
407. Menzel, A. A., Winchelsea.
411. Sutherland, A. J., Nalangil P.B., Colac.
418. Williams, O., Colac.
424. Nicholas, A. H., Birregurra.
438. Johnston, S. A., Birregurra.
442. Ray, G., Warrion.
445. Lidgerwood, R. W., Birregurra.
450. Champness, P. L., Mt. Moriac.
452. Tanis, A. F., Irrewarra.
454. Bauer, C., Cororooke.
465. Middleton, J. J., Nalangil.
468. Wilson, R. O., Larpent P.B., Colac.
485. Farquharson, Pennyroyal.
486. Ryan, F. P., Nalangil P.B., Colac.
487. Higgins, J. T., Irrewarra.
491. Stanford, F. R. J., Tomahawk Creek via Colac.
492. Mackay, David, Warncoort.
493. Turner, Miles, Nalangil.
494. Finn, T. J., Bullock Swamp via Colac.
495. Ridgeway, A., Cororooke.
497. Ridgeway, E. L., Pirron Yallock.
498. Russell, F., Cororooke.
500. Lanyon, C. M. and R., P.B., Colac.

2 Phalaris Tuberosa.

P.T.—3. Beggs, S. R., Willaura.
9. Buchholz, L. G., Lismore.
13. Trewhella, A. B., Newham.
17. Champness, P. L., Mt. Moriac.
18. Pickford, H., Clunes.
19. Myers, T. A. and E. M., Dean.
20. Calvert, L., P.B., Myrtleford.
21. Staughton, S. T., Benalla.
22. Agnew, J., Mooroopna.
23. Walters, W. and Sons, Dookie.

3. Tallarook Subterranean Clover.

T.K.—1. Head, A. C. and Son, Seymour.
8. Treloar, J. F., Tallygaroopna.
9. Gribben, E. J., Arcadia.

4. Irrigation White Clover.

I.W.—2. Hamley, H. J., Dingee.
3. Jackman, J. W., Dingee.
7. McEwan, J., Stanhope.
15. Whitney, A. E., Swan Hill.
16. Whitney, L. C., Swan Hill.
17. Whitney, W. W., Swan Hill.
18. Ennals, E. R., Katandra West.
19. Burgmann, H. W., Katandra West.
20. Down, W. W., Katandra West.
21. Neale, H. J., "The Block", P.B., Rochester.
22. Jones, W. H., "The Block", P.B., Rochester

5. Bacchus Marsh Subterranean Clover.

B.M.—1. Toose, G. C. and A. W., Smeaton.
2. Redman, G., Smeaton.
4. Koch, L. T., Wando Dale, via Coleraine.

Whole Grains for Poultry Feeding

Tests conducted at the State Research Farm during the past two years have shown that satisfactory results can be obtained by feeding to poultry whole grain and no mash, provided the necessary amount of meatmeal is consumed to balance the ration. The grain, which consists of of wheat, oats, maize and barley, may be fed in two different ways. It may be fed regularly twice a day, allowing the birds as much as they will eat at each feed or it may be always available in hoppers. With either system the meatmeal is placed in a hopper and is always available.

In view of the shortage of bran and pollard and the difficulties of transport, the simple method of feeding a variety of whole grains plus free-choice meatmeal, can be recommended, especially to farmers and others who are keeping poultry as a sideline and who may have some grain available on the farm.

Whole grain has not to be crushed or treated in any way, and in this respect it is much cheaper than other foods. Another advantage is that it cannot be adulterated without detection.

[*Contributed by the Live Stock Division*].

RABBIT DESTRUCTION

Poisoning, Fumigation, Digging Out

By E. J. Pemberton,
Superintendent, Vermin and Noxious Weeds,
Department of Lands and Survey

DURING the past year there has been a decided increase in the rabbit population in all parts of the State, except the drought-affected areas. The increase is attributed to several factors, chief of which are shortage of labour, shortage of materials, and scarcity of wire-netting.

Owing to the demands made upon producers for the supply of greater quantities of foodstuffs, all available labour was directed to this work.

Strychnine, phosphorus and fumigating materials have been in short supply, most being imported from abroad, but this disability has now been partly overcome, due to importation by Commonwealth authorities of a large quantity of strychnine, which is now available through the ordinary trading channels.

A large portion of this strychnine is in the form of a brucine-strychnine mixture, which has a strychnine content of 43 per cent. This material has been tested at the Melbourne University and the Veterinary Research Division of the New South Wales Department of Agriculture. Trials were also extended to the Lands Department, Victoria. All of the tests showed that the material was satisfactory for the destruction of rabbits. The usual practice is to use 1 ounce of strychnine to 14 lb. of apples or carrots, but if brucine-strychnine is used the quantities are 1 oz. to 8 lb. The baits should be of good sound fruit or carrots, and cut into cubes not larger than half an inch.

Greatest care should be taken to see that baits, both for "free feed" and poison baits, are sweetened with sugar and that poison baits are not put down until the operator is satisfied that the free feed is being readily taken by the rabbits.

Brucine-strychnine mixture is the most satisfactory substitute for strychnine alkaloid, and where the latter is not procurable this substitute should be used.

Phosphorus preparations in the past were used largely at this period of the year, but under recent fire legislation the use of phosphorus in any form likely to cause a fire has been prohibited. The only substitute now available is white arsenic, which can be used with pollard similarly to phosphorus. A formula has been prepared and is included in this article for guidance of landholders.

Landholders may not hope for a large distribution of wire-netting for rabbit-proof fencing for some time at least. Supplies are short, and existing wire-netting fences which have deteriorated must be made to serve by making temporary repairs to render them rabbit-proof until new netting is available.

The subject of rabbit control must give cause for serious thought and active attention of all owners and occupiers of land throughout the State. The losses caused by rabbits cannot be accurately calculated, but they must amount to many thousands of pounds annually, both from the damage they do and the expense incurred in their control. Apart

from the pastures eaten (one rabbit will eat its own weight in lucerne in one night), the fouling effect of rabbits on soil is considerable. The rabbit takes the sweetest pasture, and also the seeds and roots when the pastures dry off. Consequently, the productive capacity of rabbit-infested properties is greatly decreased.

A proclamation has been issued under the Vermin and Noxious Weeds Act requiring owners and occupiers of land on and after the 13th day of February, 1946, to destroy all vermin on their properties and on the half-width of all adjoining roads. Failure to comply with this proclamation will render offenders liable to prosecution.

The Lands Department wishes to avoid prosecutions, but landholders who comply with the Act must be protected, and it will be necessary to institute proceedings in all cases of neglect. Inspectors throughout the State, therefore, are being instructed to strictly enforce the provisions of the proclamation.

In view of the serious increase in the rabbit population the Lands Department appeals to all landholders to render the fullest co-operation in bringing the menace under control. Inspectors throughout Victoria will be instructed to deal effectively with rabbits on all vacant Crown land, and all Government Departments have been requested to co-operate in the campaign for rabbit destruction.

It is suggested that thorough poisoning work be carried out, and followed by fumigation or digging out of all burrows and other harbouring places. If landholders deal with rabbits now, large numbers of breeding rabbits will be destroyed, pastures and crops will be protected, and farming returns will increase.

In the February, 1945 issue of this Journal the following formulas for the destruction of rabbits were supplied. As these formulas have been found most useful in the campaign to eliminate the rabbit pest, they are repeated in this number for the information and guidance of land holders.

Poisoning

Apples and Strychnine.

Cut up the apples into baits about half to five-eighths of an inch square, dust with 1 oz. powdered strychnine to 12 to 14 lb. of apples, say, with a large-sized pepper castor. If brucine strychnine is used, however, 1 oz. of poison is used to each 8 lb. of fruit. (See reference to this poison in foreword to this article). Sugar in the proportion of about 1 lb. to 15 lb. of apples dusted on the bait is a great additional attraction. This applies moreso when the fruit is a little on the sour side. If the apples are sweet, less sugar is necessary. The advisability of "free feeding" *several times* beforehand cannot be too strongly recommended. In fact it is practically essential to success. The baits in "free feeding" should be similar to those which are poisoned and should be laid in the same way. If the baits free from poison are well taken, success is certain. The rabbit comes to the furrow eager and unsuspicious and falls an easy victim.

The *poisoned* baits should be laid from about 18 inches to about 6 feet apart, according to the infested state of the land. One pound of apples should make about 250 to 300 baits, therefore an ounce of strychnine should do from 2,500 to 3,000 baits. The necessary length of the furrow required can thus be readily determined.

In places where there is only a small number of rabbits it is a good plan to peel the apples used in the actual poisoning (not necessarily with the "free baits"), as every side of the bait will then absorb poison

In situations where furrows cannot be readily made, poison can be laid on scratches similar to those made when trapping. When poison is taken the furrow should be replenished until the rabbits cease to take it. It is better to err on the side of liberality than the opposite; far better to have some poison left in the furrows than to have a few rabbits left for future breeding.

Apple poisoning has come to stay, and splendid results are being obtained throughout the State wherever the above directions are properly carried out. The great points in favour of apple poisoning are:—

It is effective all the year round, no matter how plentiful the grass may be.

It is cheap and simple.

The rabbits die near the furrows.

The value of the skins will, in nearly all cases, more than recoup the cost of the work.

If the poisoned baits are put down last thing at night, and looked at early the following morning, there is little danger

to stock and bird life and, under any circumstances, if the baits are laid right in the furrows stock are not likely to get at them.

Young rabbits will take it as freely as old ones.

Carrots and Strychnine

Act in exactly the same way as with apples excepting that, as the carrot is a dry bait, it is necessary to soak the baits for awhile in sugar syrup and then drain off and use. Not only is the sugar an additional attraction, but it will also hold and absorb the strychnine.

The use of apples and carrots is strongly recommended and cannot fail if the directions are followed. The making of the bait square is emphasized for the following reasons:—When the rabbit's suspicious nature (and it has plenty of it) is lulled by the "free feeding", it comes to the poisoned bait keen and eager. The bait being square offers a nice point for a bite no matter from what side the rabbit approaches it. The animal, therefore, is able to get a sizeable piece in its mouth at the first bite. That is all that is required, for there is enough strychnine in that one bite to ensure death. The rabbit does not go away from the furrow, however, but will try other baits, until the poison does its work. That is why rabbits are nearly always found dead along the furrows. Although good results have followed the use of inferior apples, the use of good quality apples is advised for the best results. It is best to be liberal with the "free feeding." While one taste of the poisoned bait is enough, a proportion of the rabbits may eat a number of the "free" baits and thus prevent others from eating and acquiring a liking for them, so that they will take the poisoned baits later. It is advisable to put out six or seven times the quantity of "free feed" as compared with that poisoned. The baits should be clean cut and not bruised. If bruised the baits deteriorate rapidly and are not nearly so attractive to the rabbits.

Another point in favour of the above method is that there is little likelihood of destroying valuable birds, and if the baits are put down towards evening and looked to (if any are left) early in the morning, there is practically none at all.

Experience of field officers has shown that it is rare to find a bird killed by these baits, despite assertion to the contrary.

1,100 rabbits poisoned on a timbered 200-acre paddock which had previously been dug out.

Pears and Quinces and Strychnine.

Use in the same way as apples. Although these fruits have been used successfully the apples are preferred, but quinces are good in late autumn.

Arsenic and Pollard.

Dissolve 2 pints of treacle or honey, or 5 lb. of sugar, in 1 gallon of hot water and thoroughly mix 2 lb. of arsenic, 10 lb. of pollard and 2 lb. of bran in a revolving machine, churn, or in a dish or tub. Mix the arsenic, pollard and bran with the sweetened water, stirring well all the time until the mass comes to the consistency of dough. When the mixture has been well kneaded, it can be distributed with a machine or laid by hand. If laid by hand it is a good plan to place a portion of the dough at a time on a clean board, first dusting the board with dry pollard and kneading it well, then roll it out until it is about one-third of an inch thick. Cut it into cubes with each face about one-third or half an inch square. Gather up the cubes into a box in which there is some dry pollard and lay in furrows a few feet apart.

As with phosphorus preparations stock should not have access to poison trails.

Arsenic and Apples

Cut up about 12 lb. of apples into small cubes about half an inch in size. Spread on a sheet or bag, sprinkle enough sugar to make them adhesive, and work until all portions of the baits are sticky. A few teaspoons of sugar will be sufficient as too much will make a syrup.

Sprinkle ¾ lb. of arsenic through a shaker, working the sheet from corner to corner to mix poison on baits thoroughly. The baits are then ready to lay about 2 ft. apart in furrows that have been "free fed" for two nights previously.

Baits should be handled as little as possible. A spoon or a small piece of board is useful in removing baits from the bucket into the trail.

It is rarely that rabbits are found on the trail, as arsenic is a slow poison, and consequently skin values will be lost.

After using arsenic the hands should be washed with soap and water to which a small quantity of phenyle has been added.

Method of Laying Poison.

For any form of poisoning the surface of the ground must be turned over with a plough, a hoe, or some other suitable implement. The rabbit will always come to newly up-turned earth to play or scratch. It is not sufficient to merely chop the grass from the surface. These furrows should be drawn between the feeding grounds and rabbit harbour so that they will be found by the rabbit when it comes out to feed. Newly up-turned earth always attracts the rabbit. In the breeding season, however, it may be wise to run a furrow around burrows or warrens. "Free feed" and poison bait should be fed into furrows. There is a general belief that the proper time for poisoning is during the summer months only, but this is not true. There is no time of the year, wet or dry, that rabbits cannot be induced to take some form of poison. They will always take fruit or carrots. It is mainly a question of intelligent and judicious preparation.

Poisoning operations, however successful, should be followed up by other means of control. There is generally a percentage of vermin left which will quickly breed again, and these should be destroyed by digging out or fumigation. If trapping is done—and the writer cannot recommend this method of control—the traps should be set in the mouths of the burrows so that the breeding does and young ones will be caught, and not on the feeding grounds or "buckheaps" where the marketable rabbits are caught, while the does and young are left in the burrows to keep up the supply. No work is complete unless all burrows are destroyed. If left the residence is always there awaiting tenants, and is certain to find occupants in due course. This action, coupled with the destruction of other harbour—such as log fences, fallen timber and hedges, and the erection of wire-netting will soon rid a property of its rabbits.

Phosphorus and Pollard

No stick or crude phosphorus is now supplied. All phosphorus preparations are so prepared by manufacturers to reduce fire risk. As an added precaution it is a good plan to strain phosphorus liquid through coarse gauze or hessian before mixing with pollard. Phosphorus preparations are supplied in 2-lb. tins except some preparations which are sold ready for use in 25-lb. and 50-lb. containers.

Fumigating a warren

To a 2-lb. tin of phosphorus mixture add 6 pints of water, 2 lb. of sugar or 2 pints of treacle or molasses and ½ handful of salt. Stir thoroughly to ensure proper mixing then stir into the mixture 20 lb. of pollard until the mixture is of the consistency of stiff dough. Knead or roll to ensure that there is no loose pollard. Allow to cool; when cool the mixture is ready to lay out. As in strychnine poisoning the tracks should be laid between harbour and feeding and playing grounds, and if rabbits are breeding it is a good plan to run a trail around warrens and burrows. Care should be taken to see that the knife trip of the poison cart is in good order, otherwise pollard baits, which should be approximately ½ inch long, will be fed out in strings or lumps which will not be taken by rabbits, and will be a danger to stock.

Phosphorus is a slow poison and few rabbits will die on the trail. Usually when sickening they make for water which accelerates the action of the phosphorus and rabbits then die in the burrow or other harbour.

No free feeding is necessary with phosphorus poisoning and if rabbits are plentiful the trails can be run again without creating suspicion to the rabbits. This method is cheap and is recommended for summer use in dry country. As with other poisoning methods a few rabbits will always be left, and it is necessary to follow up poisoning work by harbour destruction, by destroying burrows, dead and fallen timber, &c. Prepared phosphorus bait, which is ready to use, is laid in the same way as the preceding method by the use of poison cart or by hand. When a poison cart is not available it is necessary to run a furrow trail as for strychnine poisoning. The phosphorus pollard is then pinched off into the trail in pieces about ½ inch long and placed 12 to 18 inches apart.

Fumigation

Fumigation is undoubtedly a good form of rabbit destruction, especially in sand burrows, old wombat holes, under roots of trees, and in the banks of creeks and rivers. It is useful also in flat country which, at the time of flood, is liable to have water running over it. *The danger of erosion in such places when digging is resorted to is often great,* and can be greatly minimised by the use of the fumigator. It is an infinitely less expensive method than digging out.

As with digging out, a proper system must be employed in starting the work of fumigating any infested area. Men operating the plant must not be allowed to wander indiscriminately, but should begin the work at one end of the area and work right through, being careful to check up the previous day's work before starting each day. Dogs are necesssary to put rabbits under ground, for if loose rabbits are left to harbour in logs, scrub and other hiding places, burrows already fumigated will be easily opened up. In fumigating a burrow care should be taken to dig the mouth of the opening well back to solid ground, and when filled with gas the opening should be properly sealed. In sandy country it is a good plan to heap the filling in mounds. Where air pockets form in the burrows, it may be possible for a rabbit to escape the gas fumes. It will work its way to the mouth of the burrow and will have to scratch this filling away. In doing so the gas is agitated with deadly effects upon the rabbits. It is often found in examining burrows that one or more rabbits are found dead in the mouth of the burrow. Proper filling of burrows will often prevent opening from outside.

Several methods of fumigation are practised, namely carbon monoxide gas, bisulphide of carbon gas, and cyanogas (calcium cyanide)

The Carbon Monoxide Method.

Machines are available which produce carbon monoxide gas (C.O.), which no rabbit can survive for 30 seconds. Wood and water only are required in the production of this gas. A fire is lit in the generator, and when a substantial bed of compact charcoal has been formed, the engine or hand-blower is operated. This action forces the ordinary atmosphere

through the burning mass of charcoal, which eliminates oxygen, leaving a mixture of nitrogen and carbon monoxide. This mixture passes over the water and is forced into the hose and introduced into the warren to be treated. The gas is generated quickly in large quantities and will be seen issuing from other inlets to the warren. These entrances should be closed with earth. There is no danger to the operator from this C.O. gas, as it breaks up immediately it makes contact with the open air.

Bisulphide of Carbon.

Bisulphide of carbon is a highly inflammable liquid, and care must be exercised in its use. Men using this method must not smoke or allow bisulphide of carbon to come in contact with fire. A foolish practice has grown up by some men firing this gas. This is very dangerous and unnecessary; actually, firing destroys the effects of the gas, and must be discouraged. The approved method of using bisulphide of carbon is with a "Suddeth Fumigator" using a smoke mixture composed of liquid ammonia and hydrochloric acid. "Suddeth" machines are provided for (*a*) carbon, (*b*) ammonia and hydrochloric acid, and are provided with taps enabling each mixture to be released as required. The main opening of the warren is selected for treating. This opening is dug back to solid ground and the outlet hose is inserted well into the burrow. The opening is properly sealed to prevent back flow of gas. Ammonia and hydrochloric acid is now pumped into the warren. This mixture forms a smoke which will emerge from any connected openings of the warren. Each opening is then sealed until no further smoke is seen. The smoke mixture tap is then turned off and the carbon tap turned on, and this material is then pumped until the burrow or warren is full of gas. When this is done the hose connection should be withdrawn and the opening properly sealed. All burrows and warrens are treated similarly.

If a "Suddeth" machine is not available, bisulphide of carbon can be used by pouring a small quantity on to any absorbent material, such as bagging, wool or dry cow dung. With this method each opening of the warren must be treated by inserting a piece of the treated material well into the opening of the burrow which has been dug back to solid ground. When treated, each opening is properly sealed. This method is wasteful, however, and not recommended.

Cyanogas (Calcium Cyanide).

Calcium cyanide is available in powder, flake, and granulated form.

Powder Cyanogas.—Burrows or warrens to be fumigated with cyanogas should be prepared as with other methods. Choose the main opening, dig back to solid ground and insert the outlet hose into burrow or warren; if possible choose an opening in the direction the wind is blowing. Do not close the opening. Begin pumping alternately with gas cut off. First set machine in the "On" and then the "Off" position, close all openings from which dust is seen to emerge and continue blowing until all connected openings in the warren have been located and closed. Now close the opening around the hose and continue pumping dust into the warren for a few minutes; withdraw hose and properly seal the opening.

Flake Cyanogas.—This material is used when a blower is not available. Each opening is dug back to solid ground and treated by using a long-handled ladle or spoon into which one ounce of flake cyanogas has been placed. This is then inserted full length into the burrow, poured out, and the ladle or spoon withdrawn and the burrow properly sealed. Cyanogas in powder form must only be used when blower is available.

Cyanogas quickly disintegrates when in contact with the atmosphere, and being lighter than air the gas rises quickly and, if carelessly handled, may be inhaled by the operator with ill effects. The user may with extreme carelessness be asxphyxiated. With the use of flake cyanogas, however, this disintegration is not so rapid and the danger of hand using is not so great. Where any effects are noticed the antidote is liquid ammonia, which should be used as with smelling salts.

Digging Out

While digging out appears to be a simple matter, apparently requiring no great skill, yet there are several points that may be emphasized. There is no doubt that digging out is an effective method of dealing with rabbits where it can be carried out, but at the

[*Continued on page 75*]

ZINC DEFICIENCY IN FLAX

By C. R. MILLIKAN, M.Agr.Sc., Plant Pathologist, Biological Branch

IN each of the four seasons 1942 to 1945 inclusive, many instances of flax plants showing symptoms which appeared to be identical with those of zinc deficiency, originally produced on flax grown in zinc deficient water cultures at Burnley, have been observed in flax crops in Victoria.

While most of the occurrences have been of minor importance, in that only a few small patches of plants have been affected, there have been other crops in which widespread and severe symptoms have occurred in late winter and early spring. However, even in these cases, the majority of affected plants have usually shown considerable recovery later in the spring, as described in this paper.

Fig. 1.—First symptoms of zinc deficiency in flax, showing the bronze coloured spots on the leaves and upper portions of the stems. The growing point is not always involved.

In Victoria, the disease has occurred most frequently on black soils which have an alkaline reaction, although an occasional plant showing typical symptoms has been seen in some crops growing on acid soils. The disease has been particularly severe in the Portarlington district on black soils (pH 8·3) which had been heavily dressed with sea shells (up to 20 tons per acre) some 20 years previously.

Zinc deficiency in flax has also been reported in South Australia by Adam and Piper (1944) who have proposed the name "die back" to describe the disease.

Symptoms

In the field, symptoms of zinc deficiency usually become first apparent about four to six weeks after germination, in the form of bronze-coloured spots on the upper leaves of the plant (Fig. 1).

The "bronzing" of the leaves is usually associated with (or may be preceded by) a rusty-brown discoloration of the top of the stem in close proximity to the affected leaves (Fig. 1). This discoloration may extend and cause the death of the top of the plant, giving rise to the typical "die back" condition. The dead top is usually light brown in colour. "Die back" may also occur without any bronzing of the lower leaves.

However, all plants do not develop the "die back" condition, which is due to the actual death of the growing point of the main stem. This fact is clearly indicated in Table 1. In many plants only bronzing of leaves below the growing point occurs. These leaves die and growth is temporarily retarded leading to a shortening of the internodes, and causing a rosetting of the top of the plant. Later the plant resumes normal growth. Such plants show a few dead leaves on the stem, with normal green leaves above and below (Fig. 2). Other plants may only show temporary rosetting followed by a resumption of normal growth (Fig. 3).

Where "die back" has occurred the plants show recovery by sending out second growth from the base (Fig. 4).

In the field this second growth has often made such satisfactory development that the crop has reached standard length, and has therefore been

Fig. 2.—Plants which showed bronzing of leaves without death of the growing point. Bronzed leaves now dead, and plants showing slight rosetting at top due to temporary retardation of rate of growth.

fit to harvest for fibre. A similar recovery of flax crops in South Australia suffering from "die back" in the early part of the season has been described by Adam and Piper (1944).

In Victoria few plants die as a result of zinc deficiency, under field conditions.

Effect of Time of Sowing and Manurial Treatment

In the Burnley water culture experiments referred to above (Millikan, 1942), where the zinc deficiency in the solution was maintained throughout the life of the plants, the plants did produce second growth after the death of the primary shoot, but this growth remained very stunted and the plants finally died (Fig. 5). On the other hand, where zinc was added to the solutions before death occurred, the flax plants commenced normal growth.

This result suggests that the phenomenon of prolific second growth manifested by field grown plants showing zinc deficiency symptoms in the winter months, is associated with an increase in the amount of available zinc in the soil in the spring months.

If this were so, it would be expected that sowings of flax made in late winter and early spring would develop less zinc deficiency than sowings made in early winter. To investigate this point, the time of sowing experiment described on the next page was conducted.

In this experiment, the effects of heavy phosphate dressings on the incidence of zinc deficiency symptoms were also studied. There is evidence in the literature to suggest that a relationship exists in the plant between zinc and phosphorus. Haas (1936) has shown that mottled citrus leaves contained a markedly higher percentage of phosphorus than healthy leaves. Later Chapman et al (1937), (1939), demonstrated that this mottle leaf was due to zinc deficiency, and further, that the symptoms could be accentuated or caused (under proper conditions of pH) by an excess of phosphate. It was considered that this effect probably resulted from zinc-phosphate reactions within the plant. Zinc cured mottle leaf of citrus was also observed by West (1938) to occur in superphosphate treated

Fig. 3.—Flax plants which suffered from zinc deficiency showing temporary rosetting but no leaf kill, followed by a resumption of normal growth.

citrus trees in a fertilized field, being apparently induced by the phosphate ion. Young wheat plants receiving varying amounts of superphosphate and zinc sulphate were observed by Millikan (1940) to exhibit a linear relationship between their zinc and phosphorus contents, suggesting that the application of superphosphate had increased the zinc requirement of the plant. This relationship was further investigated by Piper and Walkley (1943) who obtained a significant correlation coefficient over a wider range of phosphorus and zinc concentrations. Walkley (1940), however, has shown that superphosphate may contain from 500 to 600 parts per million (even up to 1,000 p.p.m.) of zinc. His evidence showed that the amount of zinc present in superphosphate may be of significance in plant nutrition in normal soils. The increased zinc content noted in cereal plants following an increase in the superphosphate dressing may therefore be due, in part at least, to the zinc impurities in the superphosphate. On the other hand, Jamison (1943) demonstrated that superphosphate applications increased the mobility of zinc and copper in the soil. This is due to the replacing action of calcium and to the fact that the phosphates of zinc and copper are somewhat more soluble than corresponding humates. Under these conditions, there would tend to be some leaching of zinc from the surface layers.

The site selected for the time of sowing and manurial experiment was on the property of Mr. W. Stiley, Portarlington, on an area of black clay loam which had been heavily top-dressed with sea shells many years previously, and on which a crop of flax grown in the previous season had shown severe zinc deficiency. The reaction of the soil was pH 8·3.

Method.—The experiment consisted of 96 hand-sown rows, each 30 links long with 2 links between rows. The rows were grouped into four randomized blocks each of which was split to allow for four times of sowing, with six manurial treatments to each sowing. In the full experiment therefore, there were 24 rows at each time of sowing, and 16 rows of each manurial treatment. Each individual treatment was replicated four times. A known weight of seed (8·5 grams) of the Liral Crown variety was sown in each row.

Details of the treatments applied are as follow :—

Time of Sowing.

May .. Germinated 20th May, 1945.
June .. Germinated 14th June, 1945.
July .. Germinated 17th July, 1945.
August Germinated 27th August, 1945.

Manurial Treatment.

Untreated.
Superphosphate 1 cwt./ac.
Superphosphate 10 cwt./ac.
Super. 1 cwt. + Zinc Sulphate 30 lb./ac.
Super. 10 cwt. + Zinc Sulphate 30 lb./ac.
Zinc Sulphate 30 lb./ac.

The superphosphate used contained 18 per cent. phosphoric acid.

At least three weeks after it was obvious that the maximum percentage of plants showing zinc deficiency in the rows had been attained (i.e., affected plants had "recovered" and were making vigorous growth), the plants were pulled and bagged, and were examined in the laboratory for the occurrence of zinc deficiency symptoms. A distinction was made between plants which had developed "die back" and those in which less severe symptoms (i.e., bronzing or rosetting) had occurred. Thus the percentages of "die back" and of total zinc deficiency ("die back," bronzing and rosetting) were obtained.

The percentage figures were transformed to angles (Cochran, 1938) which were then examined statistically by the analysis of variance method described by Fisher and Wishart (1930).

Results.—The results of the experiment are set out in Table 1.

Fig. 4.—Severely affected plants showing the "die back" condition. Recovery occurs by the production of healthy shoots from the base. In the field such shoots usually make prolific growth.

From these results, the following conclusions are drawn. The application of zinc sulphate 30 lb./ac. caused a large and significant reduction in the percentages of "die back" and total zinc

Fig. 5.—Water culture experiment, showing the extreme dwarfing of primary and secondary shoots resulting from the maintenance of zinc deficiency throughout the life of the plant.

deficiency at all times of sowing. It is obvious also that all plants suffering from zinc deficiency do not necessarily develop "die back".

Time of sowing had a very significant effect on the incidence of zinc deficiency in flax. The development of the disease was greatest in the June sowing, after which progressive and significant reductions in the percentages of both "die back" and "total zinc deficiency" symptoms occurred in the July and August sowings respectively. The severity of symptoms (i.e., proportion of "die back" to total zinc deficiency symptoms) was also least in the August sowing. It seems evident, therefore, that the availability of zinc in the soil is greater in spring months than in winter months.

In connection with this conclusion, the results of Ward (1944) on the efficiency of zinc sulphate sprays in controlling "little leaf" of deciduous fruit trees is of interest He found that winter sprays gave a more enduring effect than spring foliage sprays.

Superphosphate dressings by themselves had no significant effect on the incidence of zinc deficiency symptoms, in spite of the fact that the findings of Walkley (1940) indicated that a heavy dressing of superphosphate may contribute zinc in sufficient quantities to be of significance in plant nutrition. On the other hand, when applied in conjunction with 30 lb. of zinc sulphate per acre, the superphosphate 10 cwt./ac. treatment induced a significant increase (sig. > 5 per cent.) in the percentages of both "die back" and total zinc deficiency symptoms, compared with zinc sulphate 30 lb./ac. by itself. These results are of considerable interest, but are regarded as inconclusive in regard to the existence of a zinc-phosphorus relationship in the plant, as indicated in the literature citations above. Further work on this relationship is obviously desirable.

Summary

Zinc deficiency has occurred in flax crops growing in certain districts in Victoria. Its alleviation by zinc sulphate applications has been demonstrated in the field.

Affected plants may show symptoms of either "die back", "bronzing", or "rosetting". A characteristic feature of the disease is that affected plants "recover" from the disease in spring, and may make prolific and healthy second growth. On the other hand, in water culture experiments where zinc deficiency was maintained throughout the life of the plant, no such "recovery" occurred.

Time of sowing was found to have a very significant effect on the incidence of zinc deficiency symptoms in flax. The development of the disease was greatest in the June sowing, after which progressive and significant reductions in the percentages of both "die back" and "total zinc deficiency" occurred in the July and August sowings respectively. The severity of symptoms was also least in the August sowing.

TABLE 1.—Effects of Time of Sowing and Superphosphate and/or Zinc Sulphate Applications on the Percentage of "Die Back" and Total Zinc Deficiency Symptoms ("Die Back," Bronzing and Rosetting) respectively in Liral Crown Flax Grown at Portarlington, 1945.

Manurial Treatment Per Acre.	"Die Back".					Total Zinc Deficiency.				
	Time of Sowing.				Mean.	Time of Sowing.				Mean.
	May.	June.	July.	August.		May.	June.	July.	August.	
Untreated	**52·5** 46·45°	**58·7** 50·15°	**38·9** 38·49°	**16·9** 23·21°	**41·0** 39·11°	**57·2** 49·41°	**68·3** 56·33°	**49·3** 44·60°	**31·8** 33·93°	**51·3** 45·85°
Superphosphate, 1 cwt.	**53·3** 46·91°	**57·1** 49·19°	**41·4** 39·79°	**19·5** 26·04°	**42·1** 40·05°	**55·8** 48·40°	**62·8** 52·71°	**50·3** 45·16°	**38·7** 38·35°	**51·6** 46·00°
Superphosphate, 10 cwt.	**60·1** 50·85°	**57·1** 49·19°	**35·9** 36·68°	**20·2** 26·61°	**42·2** 40·16°	**63·6** 52·89°	**63·4** 52·04°	**44·1** 41·58°	**38·3** 37·96°	**51·6** 45·93°
Superphosphate, 1 cwt. + Zinc Sulphate, 30 lb.	**2·0** 8·05°	**5·4** 12·14°	**3·5** 9·09°	**1·3** 6·32°	**3·1** 8·96°	**2·3** 8·75°	**6·4** 13·32°	**5·9** 13·16°	**3·4** 10·39°	**4·7** 11·58°
Superphosphate, 10 cwt. + Zinc Sulphate 30 lb.	**3·1** 9·80°	**9·7** 16·57°	**5·4** 13·30°	**2·3** 8·24°	**5·2** 12·12°	**3·6** 10·32°	**11·1** 18·07°	**10·4** 18·67°	**7·5** 15·49°	**8·4** 15·99°
Zinc Sulphate, 30 lb.	**2·7** 9·24°	**1·5** 6·65°	**2·8** 8·46°	**1·7** 5·98°	**2·1** 7·47°	**3·2** 10·17°	**2·3** 8·58°	**4·7** 12·15°	**5·4** 13·09°	**3·9** 11·05°
Mean	**29·0** 28·55°	**31·6** 30·65°	**21·3** 24·30°	**10·3** 16·07°	**22·6** ..	**31·0** 29·99°	**35·7** 33·67°	**27·4** 29·22°	**20·8** 24·87°	**28·6** ..
				1 Per Cent. Level.	5 Per Cent. Level.				1 Per Cent. Level.	5 Per Cent. Level.
Significant Differences	Time of Sowing Manurial treatment Individual means Interaction, Time of sowing X Manurial Treatment. Sig. > 1 per cent.			4·22° 5·34° 10·35°	3·18° 4·02° 7·78°	Time of Sowing Manurial treatment Individual means Interaction, Time of sowing X Manurial Treatment. Sig. > 5 per cent.			4·92° 6·22° 12·10°	3·70° 4·63° 9·08°

Figures in bold type—Percentages. Other figures—angle transformations.

Superphosphate dressings by themselves had no effect on the incidence of zinc deficiency. However, when applied in conjunction with 30 lb. of zinc sulphate per acre, the superphosphate 10 cwt./ac. treatment induced a significant increase (sig. > 5 per cent.) in the percentages of both "die back" and "total zinc symptoms".

Acknowledgment

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References (*on page 88*)

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

A well-grown crop of tick beans in a young apple orchard

Orchard Green Manuring

OF recent years there has arisen a school of thought which claims that many of the soil troubles which occur on cultivated land are due to the use of artificial fertilizers and that the salvation of the primary producer lies in the use of organic manures, composts, or other humus-producing substances. There is undoubtedly much truth in the arguments advanced in favour of the use of organic manures but, although these people are usually eloquent and emphatic in denouncing the use of artificial fertilizers, their theories lack unbiassed experimental evidence. On the other hand, there is a huge weight of evidence in the form of results from carefully laid out experiments which proves quite definitely that artificial fertilizers have their value in improving the yields of crop plants, including fruit trees.

Artificial fertilizers and organic manures should not be considered separately in their effect on crop plants as in some ways they each achieve the one object. For instance, both of these fertilizers increase the supply of mineral nutrients to the plant. While this is the only function of artificial fertilizers, organic manures have several other important effects on soils and crop plants. These include such beneficial effects as improvement in soil structure, increased penetrability of water, better conditions for the development of soil bacteria, release of minor elements and various other factors which combine to make organic manures extremely valuable.

One of the main difficulties, to which the "organic manures only" theorists find difficulty in suggesting a solution, is to obtain adequate supplies of organic manures. Farmyard manure, which is required at the rate of 15 to 20 tons to the acre, is becoming increasingly difficult to obtain. For fruit-growers, one of the simplest and best methods of securing a supply of organic matter is to grow a crop of greenstuff for ploughing under in the spring. Apart from their value in providing a supply of minerals on decomposition, and having all the other advantages of organic manure, green crops are of value in orchards in removing large quantities of soil moisture. This is of particular importance in flat irrigated areas where drainage is a problem during wet winters.

Suitable plants for green manuring include dun peas, tick beans, New Zealand blue lupins, barley, or oats. Because of the association of nitrogen-fixing bacteria with the roots of legumes, these crops are of most value for green manures as they return to the soil large quantities of nitrogen.

A well-grown crop of tick beans when ploughed in may release the same amount of nitrogen as an application of 5 cwt. per acre of sulphate of ammonia.

Leguminous crops should be sown at the rate of 1½ to 2 bushels per acre; cereal crops at the rate of 1 to 1½ bushels per acre. Superphosphate should be sown with the crop at the rate of 2 cwt. per acre. For soils of low fertility an application of nitrate of soda or sulphate of ammonia at the rate of 2 cwt. per acre would also be necessary. Liming at the rate of 2 tons per acre on soils which are acidic such as those occurring at Harcourt, in the North-East and in southern Victoria, will also result in improved growth of crop.

For successful growth of the crop, it is essential that the seed be planted while the weather is still warm enough to provide good germination and ample growth before winter cold reduces growth to a minimum. The main difficulty in establishing a successful crop under Victorian climatic conditions is the uncertainty of adequate rains at this time of the year. In irrigated districts, the green crop may be established by providing a special watering, but in the non-irrigated areas, if sufficient rain does not occur for ploughing and sowing before the end of March, it would not be worthwhile sowing the crop unless the location and aspect of the orchard are warm and experience has shown that later sowing has been successful. Good early establishment of the green crop is necessary on peach orchards because poorly-grown crops will be destroyed by winter sprays of tar distillate or D.N.C.

Where a green crop for some reason cannot be sown, it is preferable to delay ploughing and to apply whatever fertilizers are available for the stimulation of weed growth.

RABBIT DESTRUCTION (*Continued from page 68*).

same time it is one of the easiest jobs to slum by careless workmen. It is easy to miss little runs or side burrows. If, on inspection of the filled-in burrows the next day, any clean cut holes with the soil scratched backwards is found, it will be realized that rabbits are being missed. No burrows or warrens should be left partly finished overnight. If so, nearly all the rabbits—except perhaps the little ones—will leave the burrow before next day. Any one who has had a perfectly secure wire-netting paddock dug out knows that the biggest catches are made in the last day or two. When a paddock is not netted, a good plan is to do a day's digging on, say, the north-east corner, the next day the south-east corner, and then the other corners and so on, putting in several days before coming back to the starting point. The rabbit is so suspicious that many will desert the burrows next to where the overnight work has been finished, but they will drift back again to those burrows when they find things are quiet again. By using this method all round a paddock and finally finishing with the central burrows, the best of results will be obtained. Even if the occupiers of these burrows are unsettled, they are less likely to leave because all the burrows round them have been disturbed and do not offer much harbour. This principle has been followed with much success. If a property is bad with rabbits, burrows and harbours, a good poisoning is recommended, to be followed by other means.

Burrows should not be left open after digging out, but should be levelled off, and if the time of the year suits, sown with grasses. This will destroy all signs of burrows, and any rabbits that may come later are unlikely to make fresh burrows in these places.

Good practical workers can fill in the greater portion of the burrows behind them as they go along, leaving little to do at the finish. On the other hand, if the open trenches and dirt heaps are left, a direct invitation is given to the rabbit to make a fresh start.

. The .

FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc.,
Principal, School of Horticulture, Burnley Gardens

Some Choice Shrubs

MERATIA PRAECOX, a valuable shrub which is native to China and Japan was named after the French physician and botanist—Francois Victor Merat. It has been known under two other names—*Calycanthus praecox* and *Chimonanthus fragrans*. The common name used here is the *Allspice*, because of its very fragrant waxy flowers which are borne on the bare twigs during winter.

The shrub will grow to a height of about 8 ft., and it requires a warm and sheltered position. The flowers, which are about 1 to 1¼ inch in diameter, are without petals but the outer sepals are a waxy yellow colour, and the inner ones are striped with purplish brown. The flowers last for many weeks and during this time their fragrance is one of their principal features. In spring the young foliage is a vivid green colour and older leaves are bright green, and the whole effect during the summer months is very attractive.

Punica granatum, commonly known as the Pomegranate, occupies an important place in the garden. It is a native of south eastern Europe and its habitat extended originally to the Himalayas. The leaves, flowers and fruits are attractive and few shrubs can claim so many desirable features. The shrub generally grows to a height of 8 to 10 ft. and is hardy. It requires an open, sunny position. It is deciduous and when it bursts into foliage in the early spring the young leaves are a brilliant bronze colour, and for several weeks the shrub is spectacular. The flowers occur in the summer, and these are large and scarlet in colour. The petals have a crumpled appearance and at this time the dark shiny green foliage forms a pleasant background for flowers.

The double flowered form is perhaps more spectacular while in flower, but does not fruit so heavily as the single flowered form. The fruits of the latter, with coloured leathery rind, which later splits disclosing the red pulpy mass of seed, makes it a pleasing shrub in the autumn and early winter.

There is also a dwarf form which grows to a height of 2 or 3 ft. The foliage is small but the masses of small crimson flowers and fruit make it useful as a shrub for the foreground, or as a pot plant. It can also be used as a small hedge or in the rockery.

Erythrina—There are three well-known shrubs or small trees of the name grown in our gardens. They are all deciduous and are commonly called the Coral trees. They all require the warmest situations and as much sun as possible. Shelter from westerly and southerly winds is very desirable.

From summer to autumn various members of this genus produce brilliant pea-shaped flowers on long spikes and they should all be cut back in August in order to induce new growth at the tips of which the flowers are produced. The usual method of growing these trees is to allow a stem to be produced to a height of 2 to 3 ft. or higher if desired, and then to cut back all growth to this height every August. In this way the stem increases in girth and a large head is formed upon it from which the young growth is produced every spring. As the head increases in size the number of new shoots which will arise from it also increases, so that a large bushy effect can be obtained.

One of the best of these Erythrinas is *E. Blakeii* which has long spikes of dark crimson flowers. This plant can be kept to about 4 to 6 ft. high if desired.

E. Crista-galli is a well known Erythrina and has larger spikes of deep crimson flowers, and grows a little taller than the former one.

E. Humeana grows to a height of about 5 to 7 ft. and produces rather slender spikes of brilliant scarlet flowers in late summer and autumn.

THE VEGETABLE GARDEN

Cauliflowers—Early cauliflower plants should be planted out this month and conditions should be made favourable for rapid growth during February and March. Thorough preparation of the soil before planting, by digging in a generous supply of well-rotted manure and about 4 to 6 oz. of blood and bone per square yard, will be found beneficial.

One of the best varieties to plant out at this time of the year is *Early Eclipse*, and the plants should be spaced about 2 ft. 6 in. apart each way. Protection from the cabbage white butterfly and cabbage moth will be necessary. Spray or dust with arsenate of lead at intervals of a fortnight.

Spinach—Seed of *Prickly Seeded* or *Winter* spinach can be sown this month in drills spaced about 18 inches apart. Cover the seed to a depth of about ½ inch. When large enough to handle, the young plants should be thinned out to about 4 inches apart.

Tomatoes—Continue to prune cluster and globe types of tomatoes, and where the clusters of fruit are too large it is advisable to pinch off the young fruits so that the remaining ones will attain sufficient size. Some varieties of the cluster type fruit so heavily that only some of the basal fruits of the cluster attain a reasonable size, while those at the top will be as small as marbles. It is better to remove these and allow the basal fruits to grow larger.

A side dressing of superphosphate and potash, used at the rate of four parts of the former to one part of the latter, could be applied at 3 oz. to the square yard, and lightly cultivated into the surface. Mulching with well-decayed strawy stable manure is beneficial at this time of the year.

Plants which require more nitrogen will benefit by an application of 2 or 3 oz. of blood manure per square yard, but this will only be necessary in poor soils and where the foliage is a pale green colour and growth is rather poor. It is a mistake to apply more nitrogen to vigorously growing plants as this frequently interferes with fruit production.

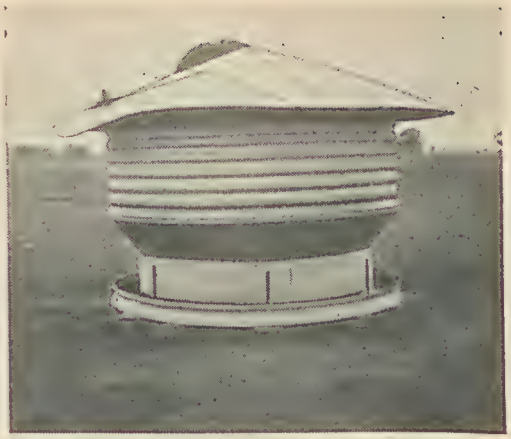
Onions—Seed of the early types of onions may be sown this month. The varieties usually favoured are *Silver Skin*, *Early Barletta* and *Australian White Queen*.

The seed can be either broadcast and covered with ½ inch of fine sandy loam, or it can be planted in shallow drills. The advantage of the latter practice is that hand weeding between the drills is facilitated.

Red Beet—Seed of red beet can be sown in drills where it is to grow, and the beds for this purpose should be well manured and lime applied at the rate of 4 to 6 oz. per square yard. *Detroit Dark Red*, *Crimson Globe* and *Derwent Globe* are very good varieties, and the seed can be scattered thinly along the drill and covered with about ¾ inch of sandy soil. Later, thin the plants to 3 to 4 inches apart.

Turnip and Swede—*White Stone* or *Purple Top Munich* varieties of turnip, and *Champion Purple Top* swede seed can be sown now in drills where the plants are to grow. Cover the seed with about ¼ inch of sandy loam. Space the rows 18 inches apart. The turnips if well grown, should be ready in about two months time.

used almost solely for the feeding of dairy stock round the metropolitan areas. Their food value (starch equivalent) and protein equivalent are as high as those of good pasture. The moisture content of wet grains is variable and influences their food value. Dried brewers' or distillers' grains are a well-balanced concentrate, and can be used to displace oats and bran, wholly or in part, in the ration for breeding, working, or dairy stock. Malt coombs (by-product of malt factories) contain a higher percentage of digestible protein. They can be fed in the same manner as grains. Barley bran (by-product from manufacture of pearl barley) is intermediate in food value between barley grain and dried brewers' grains.



A satisfactory galvanised iron self-feeder for sheep

Maize.

Because of the high yields per acre, maize is grown extensively as green fodder and as a crop for silage. The food value varies between that of barley and that of oats, but the protein content is low in comparison. Therefore, for best results with green maize or maize silage, supplementary feeds should be restricted to oaten or lucerne hay, bran, oats, or brewers' grains. Green maize is a late summer, early autumn crop, whereas oats and barley produce green feed in late autumn and winter.

Maize grain is widely used as a fattening food for pigs in conjunction with skim milk, and the combination is ideal. Too large a percentage of maize in the ration for pigs is said to produce

Table V.—Showing Digestible Nutrients and Food Values of Wheat, Barley and their Products. (Victorian figures).

—	Digestible Nutrients.				Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	Protein.	Fat.	Carbohydrate. Fibre.	Carbohydrate. Soluble.				
	%	%	%	%	per 100 lb.			1 :
Wheat and Products.								
Wheat grain	8·5	1·3	1·0	66·6	79	72	8·0	8·3
Wheaten hay	3·2	1·3	7·2	32·4	47	31	3·0	13·4
Wheat, green, grass stage	2·1	·4	1·9	6·1	11	9	2·0	4·3
Wheat, green, flowering	1·4	·4	5·0	6·2	14	11	1·1	8·0
Wheaten silage	1·4	·5	6·3	8·9	17	12	1·0	11·7
Wheaten straw	·2	·4	14·6	17·8	34	13	·1	66·8
Bran	10·9	2·1	1·3	42·0	61	44	9·9	4·5
Pollard	11·1	3·5	1·4	51·9	75	69	10·6	5·6
Barley and Products.								
Barley grain	7·2	1·2	1·5	65·1	76	71	6·8	9·7
Barley, green, grass stage	1·9	·3	2·2	7·2	12	9	1·8	5·3
Barley, green, flowering	1;8	·4	5·1	5·8	14	11	1·6	6·6
Barley silage	No figures available							
Barley straw	·8	·5	19·8	22·5	44	23	·7	54·4
Barley hulls	·8	·3	17·8	24·5	44	23	·7	53·8
Brewers' or distillers' grains (wet)	3·7	1·3	1·4	8·6	17	13	3·6	3·6
Brewers' or distillers' grains (dry)	13·1	3·5	7·2	28·5	60	46	12·6	3·4
Malt coombs (dry)	20·0	1·7	12·9	32·6	69	45	16·0	2·5
Barley bran	9·8	4·3	2·0	49·6	71	64	9·5	6·2
Malt, dry	11·0	2·4	4·5	56·4	79	72	9·9	6·1

"oily" bacon. Ground maize can be fed to working horses or fattening stock, but it is not economical or altogether suitable for feeding to breeding or milking animals, unless fed in conjunction with protein-rich fodders.

Maize oil meal and polly feed (gluten feed) are by-products from the manufacture of maize starch. Both these products are suitable for breeding and dairy stock, and can be used to displace oats, bran, or brewers' grains in the ration. They have a higher food value and contain more digestible protein than bran. Maize oil meal is a better food than bran, 1 lb. of the former being about equal to 2 lb. of the latter.

Linseed (Flax).

Stock foods from the flax plant include flax-boll chaff, linseed and linseed meal. Flax-boll chaff has a fairly high protein equivalent, being better than oaten chaff and nearly as good as clover and lucerne hays, but it is as low in other nutrients as oaten straw. Flax-boll chaff makes a balanced food as far as protein and energy-producing nutrients are concerned, but is unbalanced for bulk and total nutrients. Commercially, as a good bulk food for horses and cattle, the material is worth a price midway between the prices of oaten hay or chaff and oaten straw.

Flax seed or linseed is often boiled and used as a gruel for calf feeding, while linseed meal, the residue after the oil is extracted from the seed, is a valuable cattle and sheep food.

The high protein content and digestibility of linseed meal make it one of the best by-product fodders. Its food value (starch equivalent) is also higher than that of most grains. Although linseed meal is not regarded as a general food, largely on account of its relatively high cost, it is widely fed in the rations of all high producing dairy cows and stock fed for show purposes. On dairy farms supplying milk to Melbourne, it is difficult to maintain milk yields in the winter months without additions of linseed meal to the rations of the cows. Stock fed with small quantities of linseed meal usually appear more thrifty and have a conspicuously glossy coat, and cows produce a richer milk.

Linseed and linseed meal contain much mucilage which, in passage along the digestive tract, absorbs a tremendous amount of moisture, giving both foods appetising and laxative properties.

Linseed meal is obtained also in the form of "Sheep Nuts". Again the high protein content is utilized to balance the ration for sheep on drought stricken pastures, where the only other fodder available is dry, fibrous, protein-deficient herbage.

Linseed meal, made in the form of a gruel, is a good substitute for butter-fat when skim milk is fed to calves, but linseed meal is not a good food for pigs (porkers and baconers) as it produces an oily lard which quickly goes rancid.

Cyanogenetic glucosides are sometimes present in linseed and therefore it is advisable to feed flax-boll chaff, flax-seed refuse, and linseed meal dry, because, when moistened, prussic acid may develop. The digestive juices destroy the dry glucosides as does thorough boiling.

Cotton Seed Meal (decorticated).

Cotton seed meal is a similar foodstuff to linseed meal. It can be fed wholly or in part to replace linseed meal in the ration for dairy cows. Good samples contain considerably more digestible protein than do good samples of linseed meal. The food value of some brands of cotton seed meal, however, varies considerably.

Table VI.—Showing Digestible Nutrients and Food Values of Maize and its Products.

	Digestible Nutrients.				Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	Protein.	Fat.	Carbohydrate. Fibre.	Carbohydrate. Soluble.				
	%	%	%	%	per 100 lb.			1 :
Maize, green, flowering	1·0	·3	3·1	5·8	10	8	·8	9·7
Maize silage	·9	·4	3·2	7·5	12	9	·7	13·0
Maize grain	7·6	2·5	·8	64·5	79	77	7·4	9·4
Maize oil meal	17·2	12·9	5·6	39·5	94	88	17·0	4·5
Maize gluten feed (polly feed)	21·4	3·6	5·6	45·6	84	78	20·5	2·8
Maize bran (wet)	2·4	0·9	0·8	11·7	17	13	2·2	6·1

Lucerne hay is one of the best fodder reserves for dairy herds

Root Crops and Fruit.

Root crops are not extensively grown as stock foods. Generally, they have low food values, but this is offset partly by the heavy yields per acre and partly by the fact that they have many of the properties of green fodders and stimulate the appetite for dry food.

Along with other foods, surplus potatoes, apples, and other fruits make good foods for sheep, cattle, pigs, and poultry. Like root crops, potatoes, apples, and other fruits contain very little protein and, therefore, must be fed with protein-rich supplements. For instance, 50 lb. of lucerne chaff, or 16 lb. of linseed meal, or 4 lb. of meat meal should be fed with every 100 lb. of potatoes or apples to balance the ration. Four lb. of potatoes or 6 lb. of apples have the same food value (starch equivalent) as 1 lb. of pollard. Therefore, when pollard costs £6 per 2,000 lb., potatoes are worth 35s. per ton and apples 23s. 4d. per ton as stock foods. Potatoes and apples should be crushed before feeding to cattle and boiled for poultry and pigs.

Mangolds and turnips can be grown as winter food for cattle, sheep, and pigs. Sugar beets make good food for pigs while the tops are a good fodder for sheep and cattle in the autumn.

Molasses.

Molasses is a by-product from the manufacture of sugar, and is purely a fattening food. For general feeding, molasses should never comprise more than about 15 per cent. of the ration. The bulk of the food material in molasses is carbohydrate (uncrystallized sugar), and can be used for fat production and energy purposes only. Stock acquire a liking for molasses, which can be dissolved in an equal quantity of hot water, and as such is widely used for sprinkling over and damping down food for milking cows. Fodder treated in this manner is relished by stock.

Blood Meal, Meat Meal, and Fish Meal.

The principal constituent of blood meal and meat meal is protein, and, therefore, they can be added to the rations of all stock to balance deficiencies in protein. At present only a small quantity of these meals is fed outside poultry pens, where meat-meal is recognised as the best protein-rich supplement, but up to 15 per cent. can be added to the rations of dairy cows and pigs with beneficial results. Meat meal, as sold on Victorian markets, is not all true meat meal, but mostly carcass meal, composed of meat and bone and varies in protein and mineral content. Meat meal is the cheapest protein food available and many excellent brands are now on the market. It should be purchased on its protein content.

It is certain during the winter months that the feeding of meat meal in order to narrow and balance rations of chaff and crushed grain for milking cows and to replace skim milk in rations for pigs will be increased as the value of meat meal as a protein supplementary food becomes more widely known, and as supplies become more readily available.

Meat meal contains up to 12 per cent. digestible fat, and in this respect it differs from blood meal, which contains practically none.

When moistened, meat, blood, and fish meals are as liable to putrefy and decay as are fresh meat and blood. For this reason dry feeding is advised. If the feeder prefers damping or steaming rations containing meat meal, then to prevent ptomaines and other poisons or obnoxious products developing, all fodder should be eaten during the day that it is moistened. Similarly, meat meal should not be mixed with wet brewers' grains until feeding time.

Milk and Its Products.

Milk is nature's food for the young, and in this respect it is a perfect ration. Whole milk is too valuable to consider as a stock food, but separated milk, butter milk, and whey are as economically fed to stock as turned into other products. When dried, these products have the added value of being less bulky as well as being non-perishable. Unfortunately, the cost of drying these materials is as great as their value as a stock food.

Skim milk and first butter milk are excellent for pigs and calves to balance a grain and hay ration. Whey makes a good pig food, and older calves do well on it, but its protein content is low, and it will not balance a wide ration. Skim milk and whey must be fresh for calf feeding, but pigs do better when the products are soured.

Proteins of Animal Origin.

Proteins, such as those found in by-products of animal origin—skim milk, whey, meat meal, blood and fish meal—are known as "high quality" proteins, because they contain all the necessary amino acids or units required for rebuilding animal tissues and for growth, the production of progeny, milk, wool, &c. Twenty-two different amino acids are known and certain ones, which are necessary for animal maintenance and production, are sometimes rare in proteins of vegetable origin.

Lysine, an amino acid necessary for growth and production in animals, is deficient in the proteins of pasture and cereal hay or grain, but it is abundant in skim milk, meat meal, &c. Cystine, an amino acid necessary for wool growth in sheep, is also abundant in the animal by-products.

The feeding of a small quantity of meat meal (from ¼ to 1½ lb. per cow daily) to the dairy herd at the State Research Farm, Werribee, between 1935 and 1939 resulted in higher milk yields with a higher butter-fat percentage. Further, there were no physiological diseases, such as milk fever, amongst the cows during the period this meat meal was fed.

Sprouted Grain.

It has frequently been suggested that the feeding of sprouted grain to stock has many advantages but, in experiments with cattle and pigs at any rate, it has proved to be a wasteful and expensive practice. Nutrients are lost during the sprouting process, while the labour involved, not only in sprouting the grain, but also in feeding it out afterwards, is a burden and expense. Sprouted grain has values in correcting certain vitamin deficiencies and in feeding for special purposes to stimulate the appetite.

Soaked Grain.

The soaking of grain does not increase its food value and, although thorough soaking for at least twenty-four hours may be an advantage when cattle are fed on whole grain where crushing facilities are not available, horses, sheep, pigs and poultry do better on whole grain fed without first being soaked. Soaking is a laborious process, usually involves loss of nutrients and, in addition, moulds and undesirable fermentation may develop, particularly if the soaking vats are not kept thoroughly clean.

Straw Pulp.

Straw pulp made by softening the indigestible woody fibre in cereal straw with caustic soda or quick-lime and water received much publicity while it was being manufactured for stock feed in England and Germany during the early stages of the last war. The process is costly and, as the use of straw pulp decreased in these countries during the war, it may be assumed that any increase in the food value of the straw was more than offset by the cost of the plant and ingredients and the large amount of labour required.

Prepared Stock Foods.

Mixed stock foods, prepared by various merchants, have not been dealt with in this article and, although the majority are quite good and wholesome, the feeder is advised to compare their cost with the cost of ingredients that will make a similar food, and then decide whether the convenience of using the prepared food compensates for its higher cost.

Relative Value of Concentrates

The accompanying table has been compiled to show the relative food and monetary values of the common concentrates. To arrive at the monetary values, both the quantities of starch equivalent and protein equivalent in 2,000 lb. of the respective concentrates have been taken into consideration and each valued at nine-tenths

of a penny (·9d.) per pound. It so happens that these nutrients combined cost ·9d. per lb. in pollard, a cheap energy producing concentrate, at £6 per 2,000 lb., and in meat meal (60 per cent. crude protein), the cheapest protein-rich concentrate, at £10 10s. per 2,000 lb.

TABLE VII.—THE RELATIVE VALUE OF THE MORE COMMON CONCENTRATES.

Concentrate.	Starch Equivalent.	Protein Equivalent.	Relative Value.
	%	%	£ s. d.
(i) *Protein-Rich Concentrates.*			
Meat meal (60 per cent. protein)	84	54·5	10 10 0 per 2,000 lb.
Blood meal	66	65·0	9 17 0 ,, ,,
Peanut meal	78	42·6	9 1 0 ,, ,,
Butter-milk, dried	85	30·4	8 13 0 ,, ,,
Fish meal	59	53·0	8 8 0 ,, ,,
Meat and bone meal (55 per cent. protein)	67	43·0	8 5 0 ,, ,,
Separated milk, dried	79	28·5	8 1 0 ,, ,,
Cotton seed meal	70	33·0	7 15 0 ,, ,,
Maize gluten (Polly) feed	78	20·5	7 8 0 ,, ,,
Linseed meal	72	25·1	7 5 0 ,, ,,
Meat and bone meal (45 per cent. protein)	60	30·0	6 15 0 ,, ,,
Linseed meal, extracted	63	26·0	6 13 0 ,, ,,
Rape seed meal	54	26·9	6 1 0 ,, ,,
(ii) *Self-Balanced Concentrates.*			
Maize oil meal	88	17·0	7 15 0 ,, ,,
Coconut meal	76	15·6	6 19 0 ,, ,,
Pea meal	69	16·3	6 8 0 ,, ,,
Malt coombs	45	16·0	4 12 0 ,, ,,
Brewers' grains, dried	46	12·6	4 8 0 ,, ,,
Bran	44	9·9	4 1 0 ,, ,,
(iii) *Energy-Producing or Fattening Concentrates.*			
Whey, dried	90	11·4	7 12 0 ,, ,,
Maize, grain	77	7·4	6 7 0 ,, ,,
			0 3 7 per bushel.
Wheat, grain	72	8·0	6 0 0 per 2,000 lb.
			0 3 7 per bushel.
Pollard	69	10·6	6 0 0 per 2,000 lb.
Rice meal	72	6·5	5 17 6 ,, ,,
Barley	71	6·8	5 17 0 ,, ,,
			0 2 11 per bushel.
Barley bran	64	9·5	5 10 0 per 2,000 lb.
Oat pollard	62	8·6	5 6 0 ,, ,,
Oats	62	7·6	5 4 0 ,, ,,
			0 2 1 per bushel.
Oat bran	48	4·6	3 19 0 per 2,000 lb.
Molasses (cane)	49	1·2	3 15 0 ,, ,,

Special features of a fodder such as palatability, laxative properties, or suitability of the food for the purpose for which it is fed have not been considered in the above table.

Pigs and poultry thrive best when the bulk of their foods are selected from concentrates containing at least 60 per cent. starch equivalent.

Skim milk, wet brewers' grains, green pastures, and most other green fodders could be added to the list as protein-rich fodders, but, due to their bulk, these commodities, containing up to 85 per cent. moisture, are economical to feed only near the sources of supply.

Monetary Values of Fodders

This section is intended to familiarize farmers with the relative values of different fodders so that they may buy and feed the cheapest offering. This practice will be to their advantage, and at the same time will tend to stabilize prices. Roughages are not always cheaper than concentrates, as is generally believed. Straw, the roughest of roughages, is often the dearest fodder on the market.

The range of prices of animal foodstuffs indicates that the relative values of these fodders are not fully understood. The discrepancy in values has been accentuated as the result of war and drought. Table VIII. has not been brought up-to-date because so few of the commodities are available to-day, and the prices of those which are available are governed by ceiling, floor or fixed prices.

TABLE VIII.—FOOD VALUES AND MONETARY VALUES OF FODDERS.

Fodder.	Food Values (per 100 lb.).		Monetary Values.		
	Starch Equivalent.	Protein Equivalent.	Price Quoted in Daily Papers, 6th August, 1941.	Cost per food Unit—Starch Equivalent.	Value Based on Present Price of Pollard at £6 per 2,000 lb.
	lb.	lb.		d.	
Pollard	69	10·6	£6 per 2,000 lb.	1·04	£6 per 2,000 lb.
Bran	44	9·9	£6 per 2,000 lb.	1·64	£3 16s. 3d. per 2,000 lb.
Wheat	72	8·0	4s. 3½d. per bush.	1·20	3s. 9d. per bush.
Barley	71	6·8	4s. 1½d. per bush.	1·39	3s. 1d. per bush.
Oats	62	7·6	3s. 10d. per bush.	1·85	2s. 1½d. per bush.
Maize	77	7·4	3s. 9d. per bush.	1·05	3s. 9d. per bush.
Peas	69	18·2	9s. 3d. per bush.	2·68	3s. 7d. per bush.
Oaten chaff	42	3·5	£7 5s. per ton	1·85	£4 2s. 6d. per ton
Wheaten chaff	31	3·0	£7 per ton	2·43	£3 per ton
Lucerne chaff	35	8·3	£8 per ton	2·45	£3 8s. 9d. per ton
Oaten straw	21	0·7	£4 per ton	2·04	£2 1s. 3d. per ton
Wheaten straw	13	0·1	£3 12s. 6d. per ton	2·99	£1 5s. per ton
Barley straw	23	0·6	£3 15s. per ton	1·75	£2 5s. per ton

In Table VIII., relative food values and monetary values, including the prices at which they were quoted in the daily papers on 6th August, 1941, the cost per food unit at these prices, and the actual value of these fodders, based on the actual price of pollard, are shown.

It is seen from this table, that pollard was the cheapest stock food quoted, costing £6 per 2,000 lb., or 1·04d. per lb. starch equivalent,

in comparison with 1·85d. per lb. starch equivalent in oaten chaff, at £7 5s. per ton. These estimated values are based solely on the starch equivalent (the net energy value of the fodder). The protein equivalent has not been taken into consideration, and, on that account, the straws are actually worth considerably less than estimated above, as their protein equivalents are almost negligible. Peas, bran, and lucerne chaff have added values (not shown in Table VIII.) on account of their relatively higher protein equivalents.

The second part of this article dealing with the feeding of dairy cattle, calves, fat cattle, horses, pigs and poultry will appear in a subsequent issue of the Journal.

THE AGRICULTURAL LIME ACT

Brands Registered for 1946

LIST OF AGRICULTURAL LIMES REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE AGRICULTURAL LIME ACT 1934 (No. 4271) FOR THE YEAR 1946.

General Description.	Brand.	Calcium Oxide.	In the Form of—	Equivalent to Calcium Carbonate.	Magnesium Oxide.	In the Form of—	Degree of Fineness. Material Passing Through a 20-mesh Sieve.	Price per Ton in 11-ton Lots.	Manufacturer.
		%		%	%		%	£ s. d.	
Ground Burnt Agricultural Lime	Lilydale, No. 1	87·70	Mainly oxide	156·90	5·00	Mainly oxide	65·00	3 8 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	,, No. 2	80·00	,,	143·00	5·00	,,	60·00	2 18 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Kurdeez ..	80·00	,,	142·85	1·52	,,	55·00	3 0 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne, C.1
,, ,, ,,	Kawa Oxide	83·00	,,	149·00	1·20	,,	90·00	3 10 0	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Agricultural Slaked Lime	Lilydale ..	60·00	Hydroxide and carbonate	107·23	3·00	Mainly hydrate	72·00	2 5 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Cave Hill ..	50·00	,,	89·50	5·00	,,	72·00	1 13 0	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	White Rock	60·00	,,	107·00	2·00	,,	70·00	2 0 0	White Rock Lime Co. Pty. Ltd., 20 Queen-street, Melbourne
,, ,, ,,	Bulldog ..	51·80	,,	92·40	·80	,,	60·00	2 5 0	Bulldog Lime Co. Pty. Ltd., 344 Swan-street, Richmond, E.1
,, ,, ,,	Kawa ..	66·70	,,	119·10	1·20	,,	92·00	3 1 6	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Ground Limestone	Lilydale ..	50·00	Carbonate	89·50	3·00	Carbonate	95·00	1 6 10	David Mitchell Estate, Oliver's-lane, Melbourne, C.1
,, ,, ,,	Walker's ..	33·17	,,	60·00	·79	,,	60·00	1 5 0	David Walker, Waverley Lime Works, Lara
,, ,, ,,	Lara ..	43·00	,,	78·00	1·50	,,	75·00	1 10 0	Lara Fertilizer and Lime Co., Lara
,, ,, ,,	Kurdeez No. 1	50·40	,,	90·00	1·50	,,	80·00	1 5 0	Victorian Agricultural Lime Ltd., 422 Collins-street, Melbourne
,, ,, ,,	Kawa ..	51·40	,,	91·70	1·20	,,	75·00	1 12 6	P. Alkemade and Son, 535 Little Lonsdale-street, Melbourne

Melbourne, 3rd December, 1945.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Tubercle-free Herds

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86
Armstrong and Son	Wangaratta	105
Ballarat Orphanage	Ballarat	132
Banyule Stud Pty. Ltd.	Wangaratta	55
Beggs, A. R.	Beaufort	88
Black, I. S. Estate	Mount Noorat	60
Carne, W. J.	Pakenham Upper	27
Clark, W. J.	Monomeith	140
Cowan, G. L. S.	Bacchus Marsh	59
Cribbes, T.	Wangaratta	39
Deering, J. T.	South Wangaratta	86
Dennis, Mrs. A. A.	Frankston	23
Dookie Agricultural College	Dookie	92
Everist, F. R.	Tyabb	20
Foletta, G. G. and Son	Buxton	120
Geelong Grammar School	Corio	78
Gorman, A. W.	"Cathcart," Alexandra	57
Griffin, G. W.	Gladysdale	50
Griffiths, J. G.	Benalla	151
Gross, Mrs. G. F.	Green Lake	21
Hamilton, A.	Flinders	64
Howlett Mrs. G., and Miss E. Samuel	Lang Lang	55
Jakobi, L. W.	"Granada," Yannathan	89
Johnson, F. G.	Horsham	11
Lady Talbot Milk Supply Co.	Cranbourne	513
Lawrence, P. H.	"Rainga," Tarrawarra	83
Light, D. T.	Noradjuha	8
Longerenong Agricultural College	Dooen	42
Maloney, P. J.	Tongala	66
Middleton, J. A.	Longwarry North	70
Murray, M. G.	Lima	26
McIntosh, J.	Merrigun	35
McNabb and Son, G. A.	Irrewillipe East	159
Nancarrow Bros.	Kerang	48
Noonan, G.	Benalla	35
Noonan, Mrs. S. A.	Benalla	51
Northcote Children's Farm	Bacchus Marsh	48
Onley, W. H.	"Glenholme," Caldermeade	76
Parker, Mrs. L. M.	Tallarook	67
Payne, A. E. T.	"Yarra View," Lilydale	67
Payne, T. E. N.	"Woodburn," Kilmore	44
Poole, M. A., and D.	Caldermeade	120
Poole, M. A., and D.	Yannathan	104
Potter, W. J.	Longwarry North	130
Powell, T. S.	"Carellen," Mansfield	43
Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Roe, Thomas H. P.	Cobram	27
School of Horticulture	Burnley	6
State Experiment Farm	Rutherglen	47
State Research Farm	Werribee	245
Stephens, Dr. F.	Vermont	32
St. Joseph's Home	Sebastopol	53
Vagg, T. R.	Officedale	40
Vagg, E. J.	Leongatha	48
Warnock, J. A.	Benalla	76
Waterhouse and Son	Pakenham	55
Wells, W. G.	Caldermeade	67
Woodyer, P. A.	Mornington	19

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.
Abbey, S. G.	Mernda	7
Adams, W. J.	Traralgon	48
Alexander, Miss R.	Ballarat East	1
Allender and Ireland	Whittlesea	65
Almond Bros.	Mernda	112
Anderson, A. R.	Craigieburn	131
Anderson, Mrs. N. J.	North Geelong	18
Andison, J. A.	Thomastown	53
Andrew, J. C.	Whittlesea	47
Andrew, J. H.	Whittlesea	18
Andrew, T. S.	Whittlesea	91
Andrew, W.	Whittlesea	123
Andrews, E. H.	Templestowe	19
Angliss, Mrs. R.	Ballarat	1
Angus, W.	Moolap	6
Armstrong, Mrs. M. A.	Sebastopol	15
Artley, A.	Sebastopol	11
Atkinson; A.	Cambrian Hill	21
Atkinson, V.	Cambrian Hill	26
Attwood, F. A.	Eaglehawk	18
Baddon, D. W.	Yarragon	74
Baglin, E.	Wallington	14
Baker, A.	Bannockburn	32
Balharrie, J. A.	Whittlesea North	68
Banfield, J. G.	Rosanna	66
Barclay, A. H.	Whittlesea	93
Barker, Mrs. E. M.	Huntly	11
Barron, Mrs. A.	East Brunswick	10
Bates, D. S.	Whittlesea North	22
Bates, J.	Connewarre	21
Batten, R. J.	Wollert	51
Beasley, R.	Youroke	18
Bebbington, J.	Whittlesea	82
Beck, J. P.	Ceres	48
Beck, R. S.	Ceres	34
Bellis, Mrs. A.	Fyansford	15
Benson, R.	South Morang	40
Bertuch, A. W.	Harcourt North	24
Best, J. H.	Yarragon	36
Best, W. H.	Yarragon	24
Best and Carter	Yarragon	110
Bills, R. G.	Cambrian Hill	37

Name.	Address.	Number in Herd at Last Test.
Bingley, R. P.	West Geelong	31
Blackmore, P. J.	Ballarat North	57
Blake, Mrs. J.	Yarragon	11
Blood, J.	Ballarat	8
Blythe, R. E.	Conneware	71
Bodycoat, A.	Wollert	40
Boland, Mrs. A.	Yarragon	31
Boland, D.	Yarragon	40
Bone, E. R.	Bell Brae	14
Booth, Mrs. A.	Warrandyte	7
Borland, J.	Yarragon	87
Bourke, C. G. D.	Upper Plenty	51
Bourke, G. J.	Fairfield	82
Bourke, J. W.	Somerton	33
Bourke, W. J.	Alfredton	26
Bradbury, G.	Kangaroo Flat	19
Brady and Cunningham	Doncaster	28
Brain, J. A.	Ceres	41
Bray, Mrs. O. C.	Glenroy	34
Brereton, E.	Kennington	25
Briers, J.	Queenscliff	5
Brock, J. N.	Epping	16
Browell, L.	Golden Square	21
Brown, J.	Geelong West	6
Brown, Mrs. A.	Malden Gully	11
Brown, R.	Kennington	4
Brown, W.	Coburg	77
Brownhill, C. E. H.	Bundoora	2
Bryden, A. C.	Bendigo	18
Bumpstead, K.	Moolap	10
Bunting, J.	Epping	30
Burke, T. S.	Huntly	19
Burns, D.	Moolap	8
Burville Bros.	Mt. Duneed	40
Butler, W.	Wallan	71
Cahill, J. M.	Warrandyte	8
Callaghan Bros.	Thomastown	66
Callaghan, L.	Epping	32
Callaghan, T.	Thomastown	60
Cameron Bros.	Belmont	67
Cameron, G. A.	Conneware	36
Cameron, J. J.	Connewarre	53
Campbell, T. S.	Yarragon	8
Cardwell, E. F.	Whittlesea	62
Carroll, M.	Fyansford	28
Carr, G.	Leopold	20
Carr, W. J.	Wollert	64
Carter, R. H.	Fyansford	23
Catt, G. P.	Yarragon	53
Cavagna, Miss	Sedgwick	7
Challis, L. J.	Connewarre	57
Chandler, K. J.	Doreen	29
Charles, J. E.	Torquay	36
Child, G. P.	Epping	43
Christian Bros.	Doreen	38
Clark, H. M.	Nerrina	18
Clark, P. W.	Whittlesea	68
Clark, W. and T.	Kal Kallo	68
Clemence, S.	Warrenheip	23
Close, A. E.	Ballarat	37
Clunes, P.	Coburg	42
Cochrane, C.	Ballarat North	31
Cochrane, Mrs. E.	Hurstbridge	4
Cocks, J. J.	Marong	17
Collis, R.	Yarragon	1
Conway, L. T.	Sedgwick	10
Cook, W.	Brown Coal Mine	133
Cooke, Mrs. C. H.	Moolap West	30
Cooke, S. J.	Belmont	38
Cornfoot, D. H.	Whittlesea	44
Cotchin, E.	Epping	57
Coulter, G.	Ballarat North	19
Coulthard, J. J.	Whittlesea	72
Cox, K. H.	Heidelberg	65
Cox, H. S. and W. F.	Miners Rest	67
Crack, Mrs. E.	Bendigo	12
Craker, Mrs. H.	Warrandyte	5
Crawford, J.	Yarragon	44
Cross, G. A.	Mount Rowan	22
Crowe, P.	Gnarwarre	20
Crowle, A. J.	California Gully	7
Cuddihy, T.	Lovely Banks	26
Curtis, W. D.	Wallington	35
Dans, C.	Connewarre	80
Davey, C.	Morwell	103
David, Mrs. M.	Ballarat	2
Davies, A. H.	Drysdale	20
Davies, G.	Canadian	29
Dawson, J. F.	Whittlesea	41
Delany Bros.	Broadmeadows East	80
Dendle Bros.	Moolap	19
Dennett, C. A.	Craigieburn	40
Deppler, L.	Batesford	16
Deppler, W. W.	Yarragon	91
Deutscher, H. W.	Mernda	137
Devereux, Mrs. A.	Ballarat	—
Dickinson Bros.	Sebastopol	54
Dillon, L. W.	Epsom	18
Doggett, T.	Kangaroo Flat	17
Douglas, Mrs. J.	Alfredton	52
Downey, J.	Bellarine	41
Downing, J.	Canadian	5
Dowton, Mrs. H.	Yarragon	47
Draper, L. S.	Wollert	35
Draper, T. B.	Whittlesea	43
Drechsler, J.	Sedgwick	26
Duke, J.	Ballarat East	1
Dunnett, M.	Yan Yean	26
Dunstan, W.	Pascoe Vale	29
Dwyer, F. P.	Greensborough	40
Dwyer, J.	Donnybrook	28
Earl, H.	Highton	3
Eckersley, W. H.	Alfredton	40
Edwards, S. R.	Sebastopol	14
Elder, W. C.	Epping	54
Elford, S.	Magpie	34
Ellis, P.	Tullamarine	19
Erwin, E. J.	Connewarre	13
Evans, D.	Mount Duneed	15
Evans, G.	Marshall	41
Fairbrother, J. E.	North Geelong	23
Faulkner, G.	Yarragon	40
Fergusson, M. A.	Whittlesea	98
Ferres, Mrs. M. E.	Mount Clear	21
Finn, J.	Templestowe	38
Fitzpatrick, W.	Mandurang	9
Fitzgerald, D.	Leopold	45
Fitzgerald, E.	Leopold	30
Fitzsimmons, B.	Lower Templestowe	35
Flanagan, A. D.	Epsom	10
Flannagan Bros.	Batesford	81
Flynn, O.	Epsom	21
Foot, Mrs. R. G.	Connewarre	19
Fox, A.	Mernda	53
Fox, Mrs. C. H.	Epping	48
Franklin Bros.	Sebastopol	29
Franklin, F. M.	Sebastopol	15
French, T. W.	Wollert	57
Fuller, R. J.	Connewarre	30
Galbraith and Walker	Greensborough	31
Gallagher, J.	Golden Square	20
Gallus, E. H.	Doncaster	18
Gamble Bros.	Greenvale	153
Gardiner, A. M., Estate of	Whittlesea	101
Gardiner, C. E.	Epping	29
Gargan, M. J.	Marshall	43
Gass, S. Mc.	Wollert	29
Gentner, H.	Eaglehawk	9
Gerrett, W. T.	Ballarat North	19
Gibbs C.	Arthur's Creek	30
Gillett, R. L.	Cherry Tree, Sebastopol	23
Godfrey, A. J.	Yarragon	49
Godfrey, W. and W.	Moolap	42
Gogoll, Mrs. M. L.	Torquay	6
Gooch, W. N.	Sydenham	61
Goodfellow, P. W.	Preston	70
Graco, Bros.	Keilor	24
Graff, Mrs. M. G.	Mernda	16
Graham, A. E.	Connewarre	35
Graham, A.	Whittlesea	39
Gray, J. H.	Herne Hill	74
Green, J.	Eppalock	15
Green, R.	Leopold	27
Greer, A.	Wollert	19
Griggs, Mrs. H.	Yarragon	47
Grinter Bros.	Whittington	52
Grinter, T.	Whittington	33
Guidice, J. J.	Kangaroo Flat	7
Gunn, A. J. B.	Ballarat	7
Gunn, W.	Kangaroo Flat	11
Hall, A. M.	Bullock Creek	31
Hall, Mrs. J. E.	Whittlesea North	9
Hall, W. J.	Essendon	16
Halliwell, G.	Wollert	84
Hamilton Bros.	Huntly	17
Hamilton, C. H.	Yarragon	59

Name.	Address.	Number in Herd at Last Test.
Hamilton, T. D.	South Geelong	32
Hancorne, Miss M. R.	Yan Yean	33
Hanmer, Mrs. J. T.	Kellor	63
Hanrahan, Miss E.	Sebastopol	4
Hanrahan, N.	Sebastopol	6
Hargrave, Mrs. E. J.	Whittlesea	26
Hargreaves, W.	Emu Creek	10
Harkness, H. J.	South Morang	12
Harmer, L. T.	Thomastown	38
Harrison, H. N.	Ballarat	17
Harvey, J. and L.	Yarragon	79
Harvye, Mrs. M. M.	Yarragon	78
Hawkes Miss D.	Warrandyte	14
Hayes J. J.	Smythe's Creek	6
Hedges J. T.	Ballarat	9
Hegarty J.	Trunk Lead	4
Hehr R.	Wollert	29
Henderson J.	Donnybrook	58
Henshaw E.	Lower Templestowe	9
Herd J.	Epping	38
Hewitt C. J.	Wattle Glen	7
Hewitt H.	Ballarat	13
Hickinbotham Miss N.	Whittington	10
Higgs, R. N.	Yan Yean	58
Hilderbrand, P.	Sebastopol	21
Hill, H.	Campbellfield	48
Hill, J.	Somerton	63
Hill, J. E.	Mt. Duneed	20
Hill, R.	Highton	23
Hill, W.	Ceres	25
Hill, W.	Somerton	70
Hinchcliff Bros.	Whittington	74
Hobbs, Mrs. F. J.	Doncaster	6
Hocking, A. R.	Canadian	12
Hoctor, J. and Son	Greenvale	34
Hodge, E. G.	Junorton	22
Hodgins, J.	Alfredton	2
Hogan, Miss M.	Cambrian Hill	16
Hogan, M.	East Preston	58
Hollier, A. H.	Yarragon	16
Hooper, A.	Moolap	15
Hooper, W. R., jun.	Mickleham	2
Hose, W. J.	Grovedale	33
Houlahan, P.	Eppalock	40
Houlahan, T. J.	Eppalock	43
Howden, W.	Coburg	70
Howe, D. J., V. A., and G. S.	Yarragon	30
Huggins, R. E.	Ballarat	1
Hughes, Mrs. R. E.	Ballarat East	14
Hurrey, T. H.	Yan Yean	44
Hutchinson, J. B.	Drysdale	23
Hynes Bros.	Grant-street, Sebastopol	8
Ireland, C. E.	Yarragon	17
Irish, E. B.	Napoleons	19
Jackson, A.	Glenroy	51
Jackson, Mrs. M. A.	Heidelberg	7
Jackson, J.	South Warrnambool	3
Janefield Farm	Bundoora	43
Jeffrey, J. T.	Mernda	100
Jenkins, Mrs. A.	Mount Rowan	22
Jenkins, T. H.	Whittlesea	22
Jennings, W.	Barwon Heads	46
Jinks, J.	Curlewis	43
Johns, A.	Highton	34
Johnstone, Miss J. A.	Mernda	9
Jolly, Miss P.	Epping	55
Jones, A. J.	South Morang	37
Jones, I.	Lovely Banks	43
Jones, S. E.	Campbellfield	19
Jones, S. G.	Epsom	18
Jones, W. E.	Sebastopol	43
Jukes, C.	Epping	42
Jukes, W. H.	South Morang	38
Junor, G. M.	South Morang	69
Kane, F. E.	Warrnambool	28
Kell, W. E.	Greensborough	23
Kempton, C. J.	Highton	13
Kerr, J.	Mandurang	7
Kerwin, H. E.	Eaglehawk	21
Kilpatrick, E.	Mernda	69
Kilpatrick, Mrs. E. J.	Campbellfield	42
King, C. W.	Pascoe Vale	45
Kinnersley, F. and Son	Wendouree	19
Kirkwood, S.	Eaglehawk	12
Knight, Bros.	White Hills	31
Knight, G. A.	Sebastopol	29
Knowles, J. T.	Ballarat	3
Lacy, G. C. and Son	Cambrian Hill	32
Lacy, N. C.	Cambrian Hill	13
Langdon, C. W.	Barwon Heads	27
Lanning, W.	Moolap	17
Laskey, A. J.	Yarragon	24
Latta, Mrs. G.	Warrnambool	5
Lawry Bros	Tandara	113
Lay, P.	Alphington	35
Lee, Mrs. E.	Craigieburn	51
Lehmann, A. H.	Epping	39
Lemin, F.	Waurn Ponds	33
Lethlean, S. J.	Epping	22
Leviston, A. E.	Ballarat East	25
Leviston, G.	Ballarat East	9
Lewis Bros.	Beveridge	58
Lincoln, Mrs. L. M.	Portarlington	58
Littlejohn, E.	Grovedale	22
Lloyd, W. M.	Mickleham	6
Lobb, J. C.	Mickleham	3
Lodington, Mrs. I. E. M.	Ballarat	8
Long, H. S.	Dingee	94
Long, J. D.	Epping	70
Longuehaye Bros.	Point Lonsdale	32
Love, C. C.	Warrnambool	48
Love, J. E.	Strathfieldsaye	16
McAllister, K.	Whittington	36
Mackie, F. K.	Yarragon	63
McConachy, E. T.	Highton	33
McCormack, D.	Woodstock	39
McCormick, T.	Geelong West	24
McCulloch, Mrs. A.	Warrnambool	33
McDonald, F.	Queenscliff	63
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McPhan, M.	Doreen	55
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Miller Bros.	Greensborough	45
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Moore, R. G.	Moolap	23
Morris, C.	Sebastopol	28
Morris, E. J.	Huntly	19
Mosig, H. C.	Epping	23
Munro, M. J.	Leopold	20
Murfet, Mrs. S.	Huntly	21
Nankervis, L.	Mandurang	15
Nash, A.	Corio	44
Nash, H. A.	Tullamarine	42
Nebel, Mrs. A. E.	Thomastown	39

Name.	Address.	Number in Herd at Last Test.
Nelson, A.	Donnybrook	78
Nelson, D.	Highton	58
Nestor Bros.	Wendouree	40
New, G. H.	Craigieburn	15
Nickols Bros.	Tandara	72
Noonan, J.	Sedgwick	50
Norton, J.	Yarragon	10
Norton, O. G.	Bundoora	40
Notman, J.	Reservoir	68
O'Brien, Miss K.	Heidelberg	68
O'Dell, J. E.	Ballarat East	21
O'Donnell, P.	Wendouree	38
O'Gorman, A.	Craigieburn	67
O'Halloran, J.	Sebastopol	32
O'Halloran, W. P.	Redan	32
O'Hern, T.	Epping	61
Oliver, E. J.	Mickleham	32
Oliver, W.	Campbellfield	86
Olliver, Mrs. S. E.	Ballarat	14
O'Loughlin, W. L.	South Morang	25
O'Neill, E.	Yarragon	54
O'Toole Bros.	Yarragon	107
O'Toole, T. J.	Yarragon	10
Padovan, J.	Yarragon	28
Page, F. J.	Mount Rowan	38
Panozzo, Mrs. C.	Yarragon	92
Parker, Mrs. A. E.	Greensborough	55
Parker, R. H.	Craigieburn	91
Partridge, F.	Harcourt North	21
Pascoe, Mrs. W. J.	Glenroy	2
Pate, J.	Werribee South	38
Patullo, F. E.	Mickleham	31
Payne, A.	Tullamarine	23
Pearce, A. E.	Mandurang	55
Pearce, J.	Mandurang	24
Peck, F. J.	Sydenham	60
Peel, A. L.	Drysdale	16
Pegg, W. E.	East Geelong	6
Pellas, C. J. H.	Harcourt	10
Pentland, E.	Maiden Gully	8
Pentland, F. C.	Marong	26
Petersen, G.	Reservoir	27
Pettitt Bros.	Geelong	27
Phillipe, R.	Werribee South	21
Phillips, E.	Mt. Pleasant	22
Phipps, G.	Point Lonsdale	14
Pigdon, B. A.	Waurn Ponds	55
Pilcher, W.	Kangaroo Flat	6
Pitson, R. H.	Yarrambat	20
Pointer, F. A.	Upper Plenty	43
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Port, A.	Moolap	44
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Power, L. J.	Mernda	58
Putt, Mrs. D.	Bellarine	22
Quinlan Bros.	Epping	48
Rainey, W.	Thomastown	20
Ramage, J.	Mt. Pleasant	28
Rankin, J. W.	Yarragon	43
Rawlings, J. H.	Whittlesea North	37
Rechenberg, J.	Marshall	49
Reddish, Geo.	Coburg	11
Reeves, C. and Son	Sebastopol	19
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Renfrey Bros.	Drysdale	11
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Renkin, R.	Ballarat East	11
Reynolds, Misses	Yarragon	15
Richards Bros.	Leopold	56
Richards, T.	Ballarat	29
Richardsi W. J.	Warrenheip	20
Richardson, C.	Curlewis	45
Richardson, D.	Lepoold	23
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Ricketts, A.	Mount Duneed	29
Ridsdale, Mrs. M. M.	Yarragon	30
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Roberts, A.	Junorton	18
Robinson, J. H.	Fawkner North	42
Robson, Mrs. G. A.	South Morang	52
Rodger, T. B.	Waurn Ponds	26
Rodgers, E.	Whittlesea North	16
Rosewarne, Miss P.	Yan Yean	46
Ross, A.	Lower Templestowe	18
Rowe, Mrs. M.	Eaglehawk	19
Ruff, A.	White Hills	14
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Salathiel, R. W.	Big Hill	14
Salau, E.	Strathfieldsaye	12
Sandland, A. W.	Bundoora	30
Scarce, F. W.	Sydenham	32
Scheuffele, C.	Epsom	12
Schreenan, E. and Son	Sebastopol	73
Schultz, L. R.	Wollert	37
Scott, C. M.	Diamond Creek	49
Scott, G.	Connewarre	25
Scotti Mrs. J. M.	Whittington	118
Scott, R.	Marshall	97
Seeber, B.	Thomastown	20
Semmens, J. H.	Sedgwick	18
Sewell, J.	South Morang	31
Shankland, I. D.	Greenvale	13
Sharp, Mrs. John	Whittington	31
Shaw-Logan, T.	Glenroy	124
Sheahan, J.	Templestowe	18
Shearer, G.	Warrenheip	18
Shearer, J.	Warrenheip	11
Siebel, F.	Thomastown	29
Simpson, N.	Warragon	35
Slorach, J.	Whittlsea	29
Smirfitt, J. E.	Epping	63
Smith, A.	Fawkner North	10
Smith, F. A.	Invermay	15
Smith, H. H.	Heidelberg	30
Smith, J. R.	Mernda	32
Smith, L. W. W.	Bundoora	73
Smith, R. A.	Epping	35
Smith, S. E.	Epping	27
Smith and Mogensen	Yarragon	100
Sobey Bros.	Napoleons	72
Somerville, A.	Strathfieldsaye	34
Somerville, J.	Strathfieldsaye	31
Somerville, M.	Strathfieldsaye	11
Somerville, P.	Strathfieldsaye	31
Southon, H. W.	South Morang	40
Spedding, Mrs. S. A.	Ballarat North	5
Spencer, C. H.	Connewarre	29
Spruzen, G.	Wollert	38
Stacey, H. W.	Connewarre	60
Stacey, R.	Warrenheip	29
Stenning, R., Estate of	Wollert	34
Stephens, H.	Epping	46
Stevenson, E.	Wendouree	35
Stimson, T.	Woodstock	34
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Stow, J.	Barwon Heads	16
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Swanton, Mrs. C.	Invermay	00
Symons, Estate of J.	Marong	41
Synot, C.	Fyansford	55
Tackaberry, M.	Yarragon	21
Tait, J. M.	Barwon Heads	13
Taylor, W. C.	Ceres	20
Thomas, Mrs. E.	Broadmeadows	10
Thomas, J.	Mandurang	39
Thomas, Mrs. V. E.	Yan Yean	17
Thompson, A. E.	Sebastopol	3
Thompson, H.	Whittington	35
Thompson Bros.	Connewarre	21
Thompson, W. B.	Moolap	93
Thurl, A. E.	Yarragon	34
Toman, Mrs. A.	Golden Square	15
Tomkins, Mrs. E.	Moolap West	19
Toshack, H. J.	Wendouree	38
Towt, C. W.	Glenvale	147
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Trethowan, F. W.	Donnybrook	65
Trigg, Mrs. A.	Breakwater	20
Troutbeck, H. B.	Mickleham	39
Tuddenham, F. T.	Cherry Tree	19
Tuddenham, M. J.	Cherry Tree	36
Twigg, G. E.	Tandara	61
Twomey, A.	Greenvale	38
Tyack, N. P.	Marcus	58
Tyrell, H. S.	Highton	29
Tyrell, S. T.	Yarragon	81
Underwood, V. D.	Alphington	13
U'Ren	Campbellfield	41
Vallence, C. A.	Epping	21

Name.	Address.	Number in Herd at Last Test.
Vearing, E.	Epping	6
Vernon Estate	Cherry Tree	46
Vincent, Mrs. A.	Warrenheip	19
Wallace, R.	Breakwater	24
Wall and Faulkner	Marshall	77
Waller, R.	Ballarat	26
Walsh, B.	North Geelong	39
Walsh, C. J.	Yan Yean	7
Walton, J. C.	Windermere	28
Warner, K.	Batesford	33
Warren, E. and T.	Moolap West	36
Warren, S.	Moolap West	26
Watkins, F.	Campbellfield	40
Watson, Miss M.	Napoleons	8
Wells, A.	Napoleons	16
Wheeler, W. A.	South Morang	31
Whelpton, B.	Whittlesea North	60
White, A. J.	Yarragon	40
White, L. and S.	Alfredton	53
White, T. L. R.	Alfredton	53
White, W. H.	Ballarat West	17
White, W. H.	Smythe's Creek	57
White, W. J.	Alfredton	18
Whitelock, E. A. and E. J.	Epsom	31
Whitfield, A. E.	Bendigo	6
Whitten, R.	East Preston	74
Whittingham, E. W.	Greensboroghu	33
Wicks, C.	Golden Square	18
Wiffin, W.	Bellarine	54
Wightman, A. A.	Ballarat East	11
Williams, E.	Thomastown	35
Williamson, T. A.	Glenroy	58
Williams and Berryman	Bendigo	15
Williams, Mrs. N.	Tullamarine	40
Williamson, E. H.	Batesford	39
Williamson, H.	Greenvale	19
Williamson, J.	Doncaster (High-street)	3
Williamson, T. C.	Doncaster	79
Willis Bros.	Craigieburn	54
Wills, R. G.	North Geelong	23
Wilson, J. E.	Diamond Creek	11
Wilson, J. H.	Eltham	3
Wirth, Miss M. O.	Templestowe	15
Wolter, H. G.	Curlewis	39
Wood, A. V.	Yan Yean	159
Wrest, W.	Epping	93
Wright, T.	Tullamarine	41
Yann, R.	Wollert	41
Young, A.	Queenscliff	18
Young, L. C.	Wollert	28
Young, J. A.	Sedgwick	39
Young, Mrs. A.	Wollert	34
Young, R. L.	Wollert	26
Young, T. F.	Drysdale	27
Young, W. S.	Sedgwick	54
Zemancheff, V. G.	Craigieburn	86
Ziebell, H.	Thomastown	40

In addition to the above herds, there are 1,640 head of cattle on 273 properties supplying milk to Benalla Wangaratta, Rutherglen, and Yea that have passed two successive negative tests.

There are also 314 herds in which 10,844 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

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(*Continued from Zinc Deficiency in Flax article, page 73*)

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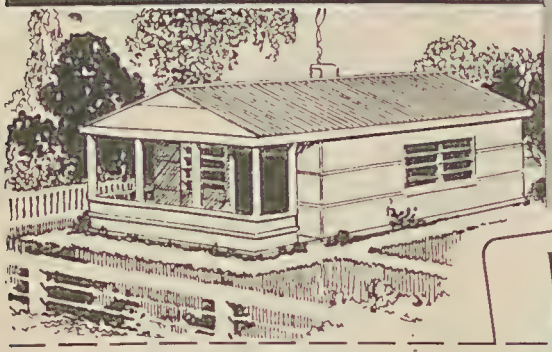

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Fat Lamb Raising in the Mallee

Results of Trials at the Mallee Research Station—Part 3

THE TIME OF MATING EWES FOR FAT LAMB PRODUCTION

By H. J. SIMS, M.Agr.Sc., Dip. Com., Manager, and C. G. WEBB, M.Agr.Sc.,
Agricultural Research Officer

Border Leicester cross lambs bred from Merino ewes. The ewe portion of these lambs was retained and used in breeding experiments.

COMPARISONS have been made between different breeds of rams and various types of ewes for the production of fat lambs in articles published in this Journal for January and July, 1945 (2) (3). The first of these trials showed (inter alia) that, from a line of strong-woolled Merino ewes, little difference could be expected in the dressed weights of lambs sired by Dorset Horn or Border Leicester rams, but that the former cross produced lambs having better conformation. The second investigation demonstrated that, of the crosses tested, the Border Leicester half-bred ewe was the most suitable under Mallee conditions for the production of fat lambs by Dorset Horn sires.

In the production of fat lambs the time of mating and the concentration of the drop are important factors. The main points to be considered in relation to mating time, particularly in the Mallee are :—

(*a*) To commence lambing at a time when green feed is available and to have lambs growing during the flush of feed.

(*b*) To have the lambs dropped in time for fattening and marketing before the pastures die off and grass seeds become troublesome.

(*c*) To have lambs available for sale before the rush of lambs from the southern districts and early enough to share in the higher prices that normally prevail during the winter and early spring.

Considering these factors it is believed that the latter half of April or early May is the most desirable time for lambing. In normal years a seasonal break is expected during or before that period, and the lamb is fattened on the natural winter grasses or cereals sown for grazing. Under

good conditions it should be possible to dispose of a first draft in late August or early September and to market all the lambs by early October.

If it is decided to arrange for lambing to occur during this period, adequate provision should be made for feeding during the critical six weeks before lambing. This is important particularly when the autumn "break" is delayed until late April or May. Most of the stubble feed will be consumed by the end of February and the ewes may then commence to lose condition. In these circumstances it is advisable to hand-feed the ewes to maintain their weight and incidentally to prevent the onset of twin-lamb disease (pregnancy toxaemia) which often occurs if ewes are losing condition during this period.

It is important that the farmer try to obtain an even drop of lambs at the most desirable time. This is even more important in districts not served by a regular or satisfactory local market, and where small numbers of ewes are kept on each farm. An even drop enables a large percentage of lambs to be lifted at the one time and simplifies marketing.

Mallee farmers have not always been able to obtain an early and concentrated drop of lambs, which no doubt is due to the fact that sheep have definite breeding seasons which vary according to the breed. For example, it is well known that pure-bred ewes of some breeds will not accept the ram until the autumn. Kelley and Shaw (1) of the Council for Scientific and Industrial Research have carried out considerable experimental work to obtain fundamental knowledge regarding the period of maximum oestrus in sheep. To ascertain this period of oestrus or "heat" vasectomised rams (rams made sterile by operation) were run continuously with ewes. These rams were raddled on the brisket and, by careful observation of the ewes, the period when the ewes came on "heat" could be ascertained. In this way it was found that the most intensive breeding season of merino, cross-bred and ewes of certain British breeds was in late summer, autumn and winter.

When the experiments in connexion with fat lamb raising were commenced at Walpeup, consideration was given to the most desirable time of mating. Opinions of farmers differed and few complete records of lambing and subsequent performances were available. It was decided to commence the mating (with 3 per cent. of rams) in mid-November, which was the time adopted by many successful farmers, and to keep careful records of lambing results for a period of years. The rams were left with the ewes for a period of four months ending in mid-March in paddocks of less than 200 acres.

Results of the mating of different types of ewes with Dorset Horn rams are shown in Table 1, which records lambing information for six seasons.

TABLE 1.—LAMBING DATA—MERINO AND CROSS-BRED EWES—1939–45.

Type and Age of Ewes.	Date of Joining Rams.	Date of First Lamb Dropped.	Percentage of Ewes that Lambed.	Lambs Dropped within One Month of First Lamb, Expressed as Percentage of Total Number of Lambs Dropped.
Riverina Merino Ewes.—Purchased 1939.				
Maiden ..	24.11.39	23.4.40	72	77
2½-year-old.	15.11.40	20.4.41	79	88
3½-year-old.	14.11.41	10.4.42	95	93
4½-year-old.	13.11.42	8.4.43	90	92
Riverina Merino Ewes.—Purchased 1940.				
Maiden ..	15.11.40	29.4.41	35	22
2½-year-old.	14.11.41	20.4.42	91	92
3½-year-old.	13.11.42	14.4.43	86	100
Dorset Horn x Merino.—Bred at Walpeup, 1940.				
Maiden ..	14.11.41	10.4.42	91	95
2½-year-old.	13.11.42	7.4.43	95	95
3½-year-old.	15.11.43	24.4.44	90	100
4½-year-old.	15.11.44	3.5.45	89	100
Border Leicester x Merino.—Bred at Walpeup, 1940.				
Maiden ..	14.11.41	20.4.42	70	93
2½-year-old.	13.11.42	21.4.43	63	100
3½-year-old.	15.11.43	30.4.44	95	100
4½-year-old.	15.11.44	6.5.45	77	100
Corriedale x Merino.—Bred at Walpeup, 1940.				
Maiden ..	14.11.41	15.4.42	47	88
2½-year-old.	13.11.42	14.4.43	73	100
3½-year-old.	15.11.43	30.4.44	62	100
4½-year-old.	15.11.44	29.4.45	67	75
South Australian Merino Ewes.—Purchased November, 1940.				
Maiden ..	14.11.41	12.4.42	87	94
2½-year-old.	13.11.42	10.4.43	83	94
3½-year-old.	15.11.43	22.4.44	73	100
4½-year-old.	15.11.44	22.4.45	78	95

It will be seen from the table that, in most cases, lambing commenced fairly close to the due date

and that, with the exception of the maiden Merino ewes in 1940–41, a satisfactory percentage of lambs was dropped within a month of the first lamb. At present no reason can be advanced for the late lambing and low lambing percentage of this group of ewes although such happenings are not unusual with young merinos. Apparently sexual maturity was delayed as practically all the ewes conceived in the next season. The maiden Corriedale x Merino ewes also showed a low percentage conception but those that did conceive did so fairly soon after joining. Considerable variation in fertility from season to season is shown in the different flocks.

A typical Dorset Horn ram.

The various factors that determine the incidence of lambing are not yet fully understood. It is obvious that the activity of the rams does play some part. Comments have been made on this aspect in a previous article (2). It is realized also that the type and amount of feed available at mating time play some part and, in addition, temperature and humidity are important, particularly if either are extreme.

The basic difference in the technique used by Kelley and Shaw to determine the height of the breeding season and that used on many farms and adopted at the Mallee Research Station was that in the former case, rams were run continuously with the ewes while, in the latter, rams were separated from the ewes from mid-March till mating time, when they were joined with the ewes. To obtain the information that Kelley and Shaw desired it was necessary to have rams with the ewes all the time.

Information collected concerning lambing on farmers' properties indicates that, where rams are kept separated from the ewes during the autumn, winter, and spring months and joined in November or early December, a good drop of early lambs is obtained, but when the rams are run continuously with the ewes, lambing is often much later—in June or July. It may be that the separation of the rams from the ewes before mating is an important factor in obtaining an even drop at the desired time.

Fat lambs bred at the Mallee Research Station from Merino ewes mated to Dorset Horn rams.

The introduction of the rams after a period of absence seems to have an effect in bringing about the occurrence of "heat" in the ewes. Workers in Western Australia (4) have observed the same phenomena and have remarked that the main bulk of the lambing commences approximately 17 days after the due date. In most years, results obtained at the Mallee Research Station show that the peak of the lambing occurs at this time.

Summary

Using 3 per cent. of rams mated in comparatively small paddocks, satisfactory percentages of lambs may be expected. It is desirable, under Victorian Mallee conditions, to join the rams in mid-November.

Information collected from farmers confirms that lambing is usually later when rams are run continuously with ewes than when rams are separated during late autumn, winter and early spring, and joined again in late spring or early summer. To have an early and concentrated drop of lambs it is an important factor to have the rams separated from the ewes at least during the winter and spring months.

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3. **Sims, H. J., and Webb, C. G.,** Fat Lamb Raising in the Mallee, Part 2, Ibid., Vol. 43, No. 7, pp. 277–284, 1945.
4. **Underwood, E. J., Shier, F. L., and Davenport, N.,** Studies in Sheep Husbandry in W. A., Part V., *Journ. Dept. Agric., West Aust.*, Vol. 21 (Sec. Series) No. 2, pp. 135–143, 1944.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-annual or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If at a re-test any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Abrahams, L. J. ..	Red Hill South	Haywood, Dr. A. R. ..	Hastings
Baker, J. J.	Bannockburn	Horn, L. A.	Leongatha North
Beechy, K.	Pomborneit	Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Betts, V. R.	Craig's Lane, Pomborneit		
Bidgood Bros.	Wodonga	Longerenong College ..	Dooen
Bodey, A. A.	"Bonnyview," Dooen	Marriott, F. C.	Bentleigh East
Bright, George H. ..	Dumbalk	Mundy Bros.	Orbost
Buller, R. A.	Beaconsfield	Noble, T. M. and Sons ..	Maffra
Castle, L. H.	Clarinda	Northcote Children's Farm	Bacchus Marsh
Coates, R. J. H. ..	Corangamite	Petersen, E. V... ..	Korumburra
Cox, H. H.	Jacaranda Stud, Leopold	Richards, Albert H. ..	Dumbalk, via Meeniyan
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Devine, Herbert	Swan Marsh	Roy, W. A.	Morrell's Hill, via Boolarra
Dookie Agricultural College	Dookie	Sexton, John	Swan Marsh
Doornbusch, John L. ..	"Starpark," Nhill	Simpson, Ronald D. ..	Birregurra
Dowie, Alexander ..	Mt. Moriac	State Experiment Farm	Rutherglen
Ellwood, A. H... ..	Paschendaele	Trenery and Sutherland ..	"Promview," Foster
Fairchild and Clutterbuck	Tinamba	Trigg, A. J.	Bungaree
Hamblin, A. T. and Sons	Toolleen	Trigg, N. H.	Bullarook
Hardinge, B. and Sons ..	Nar Nar Goon	Tweddle, J. T.	"Winlaton," Shepparton
Harris, Clement C. ..	"Egerton Villa," Loch	Warry, A. and Sons ..	Delburn
Harrison, C. T... ..	"Eastside" Stud, Pomborneit	Whelpton, B.	Whittlesea North
Hawton, I. E. and F. ..	"Rossmoyne," Colac	White, G. W.	Boolarra South

FOODS AND FEEDING

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer.

The first part of this article dealing with balanced rations and the relative food and monetary values of various fodders, appeared in the February issue of this Journal.

Rations for Stock

When prescribing rations for stock the feeder has to use his discretion and adjust them in accordance with the amount and nature of the pasturage available, the season, condition of the stock, purpose for which stock are fed, nature of the available foods, and the market value of foods to be bought.

Most hand-feeding is supplementary to pasturage. When the pastures are green and succulent, and supply a large proportion of the animal's requirements, supplementary hand-feeding can be restricted to those foods with a wide nutritive ratio (1 : 8) such as hays and grain. When the pastures are dry or drying off, narrower supplementary rations become necessary, especially for dairy cows and breeding animals. Such foods as lucerne hay, and silage, brewers' grains, oats, bran, pea meal, linseed meal, and cotton seed meal balance a dry pasture ration. Small additions of meat meal to a ration of hay and grain would make a good supplementary feed to dry pasture.

Nearly all feeding standards have evolved from feeding tests in which the experimental animals have been housed. These test animals are not exposed to the variable and frequently very unfavorable weather conditions, and they have no laborious exercise in walking to and from milking sheds or grazing for hours over a sparse pasture for sufficient food to satisfy their hunger. The requirements of laboratory animals, especially horses and cattle, will therefore be less than for stock grazed out under natural conditions.

Dairy Cattle

Daily rations for milking-cows *wholly* hand-fed should consist of as much roughage (hay, chaff,

TABLE IX.—FEEDING TABLE FOR DIFFERENT BREEDS OF CATTLE (TOTAL REQUIREMENTS WHEN HOUSED)

—	Jerseys and Guernseys. 800-lb. live weight. 5·0 % milk.		Ayrshires and Red Polls. 1,000-lb. live weight. 4·5 % milk.		Shorthorns. 1,200-lb. live weight. 4·0 % milk.		Friesians. 1,200-lb. live weight. 3·6 % milk.	
	Roughage (Hay).	Concentrate.	Roughage.	Concentrate.	Roughage.	Concentrate.	Roughage.	Concentrate.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Maintenance	15	..	18	..	21	..	21	..
,, + 1 gal. milk ..	23	..	25	..	28	..	28	..
,, + 2 ,, ,, ..	17	7	25	3½	28	3½	28	3
,, + 3 ,, ,, ..	13	12	19	10½	21	10½	25	9
,, + 4 ,, ,, ..	9	16	15	14	18	14	22	12
,, + 5 ,, ,, ..	6	20	12	17½	15	17½	19	15
,, + 6 ,, ,, ..	3	24	9	21	12	21	16	18
,, + 7 ,, ,, ..	..	..	6	24½	9	24½	13	21
,, + 8 ,, ,, ..	..	..	3	28	6	28	10	24
,, + 9 ,, ,, ..	..	..	..	..	3	31½	7	27

or silage) as the cows will eat, and concentrates in proportion to the milk yields, as follows:—

Friesian Cows—3-lb. concentrate per gallon of milk.

Red Poll, Ayrshire and Shorthorn cows—3½-lb concentrate per gallon of milk.

Jersey and Guernsey cows—4-lb. concentrate per gallon of milk.

With good roughage, most cows should produce at least 1½ gallons of milk daily without concentrates, while cows giving under 2½ gallons a day should be able to utilize sufficient roughage to displace portion of the concentrates, as calculated above. If concentrates are cheaper than purchased roughage, as has been the case for some years, the use of this scale must be modified for economical feeding.

The requirements of the different breeds of cows when housed are shown clearly in Table IX, on the previous page.

The appetite or amount of food that a cow can eat is limited. For this reason, the amount of roughage fed must be decreased for higher milking cows to enable them to eat the requisite amount of concentrates. For instance, an ordinary 800 lb. dry Jersey cow can eat and digest up to 22 lb. ordinary dry food. The production of milk increases the appetite, and a milking Jersey cow, of similar weight, can eat up to 27 or 28 lb. of ordinary dry food. The appetite is stimulated also by exercise and weather conditions and the rate at which the food passes through the digestive system.

To obtain a balanced ration for milking cows the roughages and concentrates should be so mixed that the starch equivalent is not more than five times the protein equivalent.

Hay and silage are the most common supplementary winter foods, and are adequate for cows producing round 1½ gallons milk daily. Heavy milking cows will either drop in their milk yields or lose condition if fed entirely with roughage as a supplement to winter pasturage.

The food requirements of cattle in terms of starch and protein equivalents, and determined by actual feeding experiments in Europe, are set out in Table X. The results shown in this table are applicable more accurately to housed stock that receive sufficient exercise for good health, a practice, while common in European countries, is rarely experienced here.

TABLE X.—TOTAL FOOD REQUIREMENTS OF CATTLE IN TERMS OF PROTEIN AND STARCH EQUIVALENTS. (HOUSED STOCK).

Maintenance Requirements.

Live Weight of Animal.	Dry Matter.	Starch Equivalent.	Protein Equivalent.
lb.	lb.	lb.	lb.
200	10	2·7	·27
400	13	3·5	·35
600	16	4·3	·43
700	17½	4·7	·47
800	19	5·1	·51
900	20½	5·5	·55
1,000	22	6·0	·60
1,100	23½	6·5	·65
1,200	25	6·9	·69
1,300	26½	7·3	·73
1,400	28	7·7	·77
1,500	29½	8·2	·82

Requirements for Each Gallon of Milk of Varying Butterfat Percentages.

Butter-fat Percentages.	Starch Equivalent.	Protein Equivalent.
%	lb.	lb.
3·0	2·1	·51
3·5	2·4	·58
4·0	2·7	·64
4·5	3·0	·71
5·0	3·2	·78
5·5	3·5	·85
6·0	3·7	·92

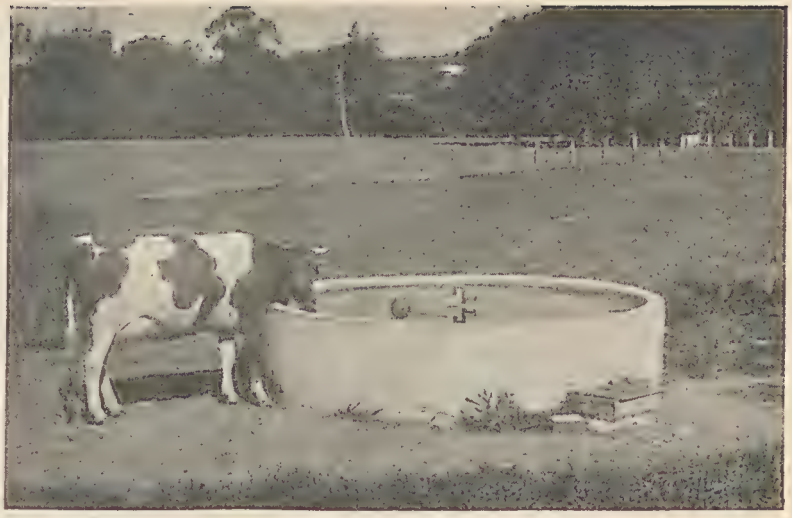
Requirements for Increases in Live Weight.

Age of Animal.	Condition of Animal.	Starch Equivalent Required per lb. Increase in Live Weight.
		lb.
Under 2 years	Store ..	2
,, ,, ...	Forward ..	2·25
2 years	Store ..	2·25
,, ...	Forward ..	2·5
Over 2 years	Store ..	2·5
,, ,, ...	Forward ..	2·75
,, ,, ...	Half fat ..	3
,, ,, ...	Fat ..	4

The nutritive ratios of rations for store cattle should be from 1 : 8 to 1 : 10, and for growing or fattening cattle from 1 : 6 to 1 - 8.

Computing Rations for Milking Cows

When fed in insufficient quantity in the ration, protein becomes the limiting factor in the digestion of the other constituents, and a large portion of these constituents is wasted. When computing rations for heavy milking cows (cows giving over three gallons milk daily) that have not access to green succulent pasture, difficulty is experienced in raising the protein content of the rations to the required figures. The addition of a small quantity of meat meal to the supplementary rations of cereal chaff and crushed barley to the cows in the herd at the State Research Farm, Werribee, in the winter when the pastures are unusually sparse, has had a remarkable effect in improving the yields of the cows It is. obvious that there was a protein deficiency which was corrected by the meat meal.



An adequate clean water supply is a necessity on any farm.

Green succulent pasturage also stimulates the appetite, and it is noticed at Werribee that when the pasturage is scarce, the cows, when changed into a new paddock, not only graze more and come into the bails with a full appearance, but also they readily consume larger quantities of supplementary feed than they do after being in the paddock two or three days.

Bran is an excellent foodstuff for milking cows and, in itself, is a balanced ration. To compound a balanced ration for milking cows from bran and chaff is almost impossible, since, if more than 1 lb. of oaten chaff is added to 4 lb. of bran, the ration is too wide. Nevertheless, when added in smaller proportions, bran does improve a ration of chaff.

The following rations have been worked out to familiarize readers with the use of the tables mentioned in this article :—

Example 1.—A complete ration for a cow, weighing 800 lb. live weight and producing two gallons of milk testing 5 per cent. butter-fat daily. No grazing being available to the cow.

By referring to Table IX. such a cow would require 17 lb. roughage (hay or chaff) and 7 lb. concentrates daily. The nutritive ratio of the ration would need to be 1 : 5.

Using Table X. the requirements of the cow are as set out in the next column.

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
Maintenance	5·1	0·51
Milk production (2 gallons, 5 per cent. test) ..	6·4	1·56
Total ..	11·5	2·07

(*a*) Suppose that the owner has oaten chaff, ground oats, bran, and meat meal available. The ration could then be mixed somewhat as follows :—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
17 lb. oaten chaff ..	7·14	0·595
3 lb. ground oats ..	1·86	0·228
2 lb. bran	0·88	0·198
2 lb. meat meal ..	1·68	1·090
Total ..	11·56	2·111

This ration is approximately correct.

With oaten chaff at £7 5s. per ton, bran at £6 per short ton; oats at 3s. 10d. per bushel, and meat meal at £12 per ton, this ration will cost approximately 1s. 8d. per cow per day.

(*b*) The cheapest ration to buy, and one that contains sufficient roughage for rumination will contain the following foodstuffs:—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
10 lb. oaten chaff ..	4·20	0·350
8 lb. pollard	5·52	0·848
2 lb. meat meal ..	1·68	1·090
Total ..	11·40	2·288

This ration will cost approximately 1s. 4½d. per cow per day

Example 2.—A supplementary ration for a cow, weighing 1,000 lb. live weight, producing 3½ gallons of 4·5 per cent. milk on a green succulent pasture estimated to supply three-quarters of the total requirements of the cow.

The requirements of the cow are as follow (see Table X.):—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
Maintenance	6·0	0·60
Milk (3½ gallons, 4.5 per cent. test)	10·5	2·48
Total ..	16·5	3·08

The grass cropped by this cow from the pasture will weigh 88½ lb. and will contain 12·39 lb. starch equivalent (three-quarters of her total requirements) and 4·02 lb. protein equivalent. It will be seen at a glance that the cow is receiving more protein than is required, therefore the supplementary food need not contain any protein and can be selected from the cheapest foodstuff available. All that the cow requires is 4·11 lb. starch equivalent, and this can be supplied by 10 lb. oaten chaff, 6½ lb. oats, 5½ lb. crushed barley, 6½ lb. dry sugar beet pulp, or a little over 5 lb. crushed wheat, &c., daily.

Example 3.—A cow, 1,200 lb. live weight, producing 5 gallons of 3·6 per cent. milk on a short green succulent pasture that supplies about one-quarter of the cow's requirements. (Such a pasture would be common in Gippsland and late Western District centres in the winter months.)

The food requirements of the cow are as follow (see Table X.):—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
Maintenance	6·9	0·69
Milk (5 gallons, 3.6 per cent. test)	12·1	2·96
Total ..	19·0	3·65

A suitable supplementary ration for this cow would be as follows (the pasture is also included):—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
34 lb. green succulent pasturage, equal to one-quarter the full ration ..	4·76	1·530
19 lb. mixed grass hay ..	6·84	0·551
10 lb. dry brewers' grains	4·60	1·260
3½ lb. crushed maize ..	2·69	0·259
Total ..	18·89	3·600

Example 4.—A cow, 900 lb. live weight, producing 3 gallons of 4·5 per cent. milk on a dry pasture, such as is common in most districts in late summer. To illustrate this example the analysis of the pasture is taken as being the same as that of pasture hay.

The requirements of the cow are as follows:—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
Maintenance	5·5	0·55
Milk production (3 gallons, 4.5 per cent. milk) ..	9·0	2·13
Total ..	14·5	2·68

To supplement the dry pasture, suppose that the owner has green maize, polly feed, and fresh brewers' grains on hand. A suitable ration would then be as follows :—

—	Starch Equivalent.	Protein Equivalent.
	lb.	lb.
15-lb. pasture (estimated quantity grazed by cow)	5·40	0·44
20 lb. green maize ..	1·60	0·16
8 lb. polly feed ..	6·24	1·64
10 lb. fresh brewers' grains	1·30	0·36
Total ..	14·54	2·60

Calves

Those familiar with the bucket feeding of calves know that the more often a young calf is fed the better it will thrive. For this reason, some young calves are fed regularly three, or even four, times a day. Although this is desirable it is not always practicable, therefore it is better to feed calves properly twice a day than irregularly, more often.

A young calf requires approximately 1 lb. new milk for every 10 lb. live-weight, twice daily. Calves will do better on milk testing from 3·5 to 4·0 per cent. butter-fat, and it is found that the addition of water to dilute richer milk to this butter-fat percentage assists digestion.

Calves will commence to eat pasture and dry feeds soon after they are one week old, and, at two to four weeks old the new milk can gradually be displaced by skim milk or a gruel. At Werribee, the gruel found to give best results is a mixture containing equal parts of linseed meal and pollard or finely ground wheat, 1 lb. of the dry meal being boiled with 1 gallon of water. Good results have also been obtained from gruels containing one part of linseed meal and five parts of pollard or finely ground wheat, when some skim milk and green pasture are also available.

Usually the bucket feed is limited to 1 gallon per meal, and other food in the form of pasture, hay or other supplement, is made available to the calf in accord with the requirements for maintenance and live-weight increases as specified in Table X. All bucket foods should be offered to calves at body temperature (100° F.).

Calf feeding is facilitated by the use of bails.

Beef Shorthorn cattle in the Western District.

Fat Cattle

The new system of producing beef (and other meats) is to fatten the stock as they grow and have the cattle ready to kill between two and three years old. This is possible only where a continuous supply of food is available on the farm. If purchased foods have to be depended upon to fatten cattle, the venture usually becomes a financial failure, therefore pasture and fodders, conserved on the farm, must be utilized to the fullest extent.

According to the average results of seventeen experiments in the United States of America, it takes just over 5 lb. starch equivalents, including the maintenance requirement, to produce 1 lb. gain in live-weight. To show a profit with beef at 40s. per 100 lb., the cost of the foodstuffs would have to be about £1 10s. per ton. Pasture can be grown at considerably less than this figure and, in a normal season, a ration of pasture and home-grown hay supplements could also be produced at less than £1 10s. per ton.

In an experiment at Werribee, thirteen head of housed cattle, commencing with an average live-weight of 929 lb. and an average age of 77 weeks, were fed for nine weeks on an average daily ration of 22 lb. food (15½ lb. shandy chaff, 4½ lb. bran, 1½ lb. pollard, and ½ lb. linseed meal) per head. During this period the average gain in live weight was 1¾ lb. per head per day. The daily ration contained approximately 9 lb. starch equivalents per head and the results agree with the average of the American experiments. The cost of producing the actual gain in live weight is often greater than its actual selling price, but this is usually offset by a greater selling price per 100 lb. over the whole carcass of the finished beast.

The food requirements of beef cattle can be worked from Table X., where the requirements for maintenance and live weight increases are shown.

Horses

Generally, horses are suitably fed on basal rations of good quality chaff with added quantities of oats or other concentrate, according to the amount of work that they are doing, and small quantities of greenstuff. On a farm varying proportions of the horses' requirements may be obtained directly by grazing.

Horses require rations with nutritive ratios of approximately 1 : 8. Since the nutritive ratios of fodders usually fed to horses are round this figure, the rations will be balanced. Oats, as a grain supplement for horses, are deservedly popular. When oats have to be displaced by other forms of grain or concentrate, it must

not be done on a pound for pound basis, but in the following proportions. The figures shown are the equivalent of 10 lb. of oats :—

	lb.
Wheat	8·0
Bran	14·1
Barley (grain)	8·7
Brewers' grains (dry)	13·4
Maize oil meal	7·0
Linseed meal	8·6
Pollard	9·0
Maize (grain)	8·0

Greenstuff can be used to displace part of the chaff in the ration, by using 4 lb. greenstuff in place of 1 lb. chaff. Small quantities of feed should be given regularly at frequent intervals. The horse should be given at least four feeds daily, and larger portions of the grain ration should be given at feeds when the horse has least time to eat.

Horses should always be offered water before meals. The water, then, has an uninterrupted passage to the caecum, where it is stored. Watering after feeding is the cause of most cases of colic and other digestive disorders, due to undigested food being washed from the stomach into the intestines. It is customary to rest horses on one day each week and either turn them out to pasture or give them a laxative ration of greenstuff or bran.

The requirements of different sized horses doing different amounts of work are set out in Table XI. It is impossible to define just what light, medium, and heavy work is, and much has to be left to the feeder to increase or decrease the oat ration according to whether the horse is losing or gaining condition. Most farm work would fall into the light and medium classes.

From Table XI. the ration recommended for a medium draught horse at moderately heavy (medium) farm work is 22 lb. chaff and 6 lb. oats daily. When chaff is dear and wheat is cheap however, this ration could be substituted for one containing 12 lb. chaff, 4 lb. oats, and 8 lb. crushed wheat, and should be given in four feeds daily.

The fallacy that wheat should never be fed to horses has probably originated from the trouble associated with uncontrolled methods of feeding. For instance, there is a tendency to overfeed horses which are given a concentrated ration, as one containing a large proportion of wheat, since they will have consumed sufficient food for their daily needs before their stomachs are full, and, until horses' stomachs are full, they will have appetites and eat more feed. If more is given, the animals will probably become foodsick or show signs of other digestive disorders.

Brood mares and young stock should be fed more greenstuff and lucerne chaff and be allowed as much grazing as possible.

Sheep

Each year in Victoria more and more sheep are receiving supplementary hand-feed during the months when pasturage is scarce. On larger sheep farms very little home grown fodder is conserved, and the principal supplementary hand-feeds are wheat, oats, and linseed meal nuts. These concentrates are preferred to roughages, because not only are they readily eaten by the sheep without waste, when, as is usual, they

Well-fed farm horses at pasture.

TABLE XI.—FEEDING CHARTS FOR HORSES.

Requirement of Starch and Protein Equivalents.

Nature of Work being done.	Light Horse (1,000 lb. Live Weight).		Medium Horse (1,200 lb. Live Weight).		Heavy Horse (1,400 lb. Live Weight).	
	Starch Equivalent.	Protein Equivalent.	Starch Equivalent.	Protein Equivalent.	Starch Equivalent.	Protein Equivalent.
	lb.	lb.	lb.	lb.	lb.	lb.
Maintenance (idle)	7·2	0·8	8·2	0·9	9·2	0·0
Light work	9·2	1·0	10·5	1·2	11·8	1·3
Medium work	11·6	1·4	13·2	1·6	14·8	1·8
Heavy work	14·0	1·9	15·9	2·1	17·8	2·3

Suitable Rations of Oaten Chaff and Oat Grain.

Nature of Work being done.	Light Horse (1,000 lb. Live Weight).		Medium Horse (1,200 lb. Live Weight).		Heavy Horse (1,400 lb. Live Weight.	
	Chaff.	Oats.	Chaff.	Oats.	Chaff.	Oats.
	lb.	lb.	lb.	lb.	lb.	lb.
Maintenance (idle)	17	..	20	..	22	..
Light work	22	..	25	..	24	3
Medium work	20	5	22	6	24	8
Heavy work	18	10	20	12	22	14

are spread on the ground, but also the freight and cartage costs are less, and a minimum amount of labour is involved in feeding them out.

Top-dressing, rotational grazing, better utilization of the pasturage in the flush season, and irrigation, are some of the more modern practices employed to increase the carrying capacity of farms. Cases are on record where the carrying capacity has been increased twelve times what it was prior to the introduction of improved methods. Under these conditions, supplementary hand-feeding in lean seasons becomes essential.

It is customary for ewes to lamb during the winter which, south of the divide, usually is the leanest period of the year. Fewer losses of ewes and lambs, quicker maturing lambs, heavier fleeces from the ewes, and better conditioned ewes are a few of the advantages due to supplementary hand feeding.

The total food requirements of sheep vary considerably, and it is still controversial as to what a sheep really requires, since research workers continually get very divergent results.

In 1926, at the State Research Farm, Werribee, J. E. Thomas maintained wethers (80–85 lb. live-weight) on as little as 3 oz. linseed nuts, plus 1½ lb. oaten straw per wether per day. This represents a maintenance requirement of less than 4 lb. starch equivalent per sheep (100 lb. live-weight) per week. Later, during 1931–32, in experiments relating to the rotational grazing of irrigated pasture, E. T. Beruldsen and A. Morgan showed that ewe weaners averaging 64 lb. live-weight at the beginning of the trials consumed an average daily ration of 7.8 lb. succulent irrigated pasture per head per day and increased in weight to 113 lb. at the end of the trials, twelve months later. This ration included maintenance, growth and some fattening and is equivalent to a ration containing approximately 7 lb. starch equivalent per sheep (100 lb. live-weight) per week.

From the work of Thomas, and Beruldsen and Morgan, the feeding standards of sheep used by the British Ministry of Agriculture, and based on experiments conducted at the School of Agriculture, Cambridge, appear to be too high (9 lb. starch equivalent per 100 lb. live-weight per week

[*Continued on page 121*

-: LIVE STOCK NOTES :-

Compiled by A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

Meat Production

VICTORIAN meat production during the calendar year 1945, was approximately 68,000 tons below that of the previous year and about 53,000 tons below 1943 production. The meat production during these three years was as follows :—

—	1943.	1944.	1945*.
	Tons.	Tons.	Tons.
Beef and Veal ..	111,000	98,000	90,000
Mutton and Lamb ..	137,000	156,000	101,000
Pig Meats	22,000	31,000	26,000
Total	270,000	285,000	217,000

* Estimated.

Drought conditions set in during 1944 and slaughterings were high for the reason that farmers commenced selling stock heavily. This heavy selling continued during the first six months of 1945 and it was only after the weather broke during late June that slaughterings eased. Since then slaughterings of cattle and pigs have been about 25 per cent. and of sheep and lambs 50 per cent., less than during the same period of 1944. The numbers of stock slaughtered during each of the three half-yearly periods prior to 31st December, 1945, are as follow :—

—	July to December, 1944.	January to June, 1945.	July to December, 1945.
	Numbers.	Numbers.	Numbers.
Sheep	2,324,000	2,558,000	1,372,000
Lambs	2,855,000	908,000	1,243,000
Bullocks	81,000	83,000	57,000
Cows	102,000	134,000	84,000
Young Cattle ..	39,000	41,000	23,000
Calves	211,000	108,000	161,000
Pigs	223,000	210,000	154,000

The low slaughterings during the last six months have been necessary to enable farmers re-stock and, in the case of lambs, due largely to the fact that many ewes had not been mated and lambings were very light. The large drop in pig production has been due to the difficulty dairy farmers have had in obtaining pollard and grain and in some cases to the change over from separating to the sale of whole milk. The reduction in the sale of cows, young cattle and calves which are mostly dairy stock should assist

in maintaining dairy cattle numbers which have been declining for some considerable time now. The dairying industry has been gravely affected by the slaughter of dairy cattle and it is hoped that the turning point has now been reached.

Dairy Cows

The benefits of rearing calves and young cattle well and of looking after and adequately feeding dry dairy cows and springers are conspicuous. The cows in many of the highest-producing pure-bred herds are not receiving any more feed than many lower producing cows of similar breeding in other herds. In some cases this probably is due to the fact that calves, in the high-producing herds, have been well fed and reared into strong healthy animals, whereas the health and constitution of the cows in some herds have been undermined by under-feeding as calves, and poor rearing conditions generally. In the high-producing herds, the dry cows and springers usually are either grazed on good pasture or given sufficient supplementary feed so that they will calve in good condition.

In northern Victoria, many herds have been severely affected by the 1944-45 drought. The present lactation yields of many adult cows will be low, while the constitution and growth of many heifers have been so severely affected that they may never become top producers. In several herds visited recently by the writer it was found that, where portion of the stock had been sent away on agistment and the remainder kept at home and maintained on scant rations of hay, potatoes, straw, and whatever other fodder could be obtained, the stock maintained at home had done ever so much better. The owners were surprised that these animals did not die, but to-day the cattle are outstandingly superior to those brought back from agistment, and which, in condition, are at least six months behind their home-fed herd mates, although the agistment was in all cases regarded as good. The benefits of keeping stock at home as against agisting them have been so great that their owners claim they will never be caught again without sufficient conserved fodder to tide them over a major drought.

Pig Raising Competitions

With the object of encouraging a fuller appreciation of production recording in pigs and to enable stud pig breeders to demonstrate the ability of their pigs to produce litters of pigs superior in litter size, growth rate and carcass quality, the Royal Agricultural Society and the Victorian Department of Agriculture are co-

The winning entry of baconers exhibited by Messrs. Fairchild and Clutterbuck of Tinamba, in the 1941 competition. The live pig, the carcass of its litter mate and a section of the carcass are shown.

operating in providing competitions for the production of baconer and porker pigs, which will terminate in the exhibition of pigs at the Royal Show, to be held in Melbourne next September.

For these competitions, the birth dates and the weight of litters at eight weeks' old will be officially recorded by the Department of Agriculture. An entry comprising two uniform pigs from each recorded litter will be exhibited at the Royal Show where they will be weighed; one of the two pigs will then be slaughtered and its carcass appraised.

Points will be awarded according to a fixed scale for the total weight of litters at eight weeks' old, for the rate of growth of the two pigs exhibited from birth to bacon or pork weights, and for the carcass quality of slaughtered pigs.

As the system of scoring is based almost entirely on weights and measures, leaving practically nothing to the opinion of the judge, the results will give factual information of consider-

able value to exhibitors and to the pig industry generally, by directing attention to breeding and feeding methods which give superior results.

Live pigs and carcasses will be displayed at the Royal Show and should provide a valuable object lesson.

An attractive cash prize list aggregating £80, which is largely contributed by the Victorian Branch of the Australian Stud Pig Breeders' Society, and certificates of merit issued by the Victorian Department of Agriculture, add to the incentive for stud pig breeders to provide a larger number of entries in the competitions.

Competitions similar to the above-mentioned were conducted in 1940 and 1941, and terminated in the exhibition of pigs and carcasses at the Melbourne City Abattoirs, but transport difficulties caused by the war prevented continuance of the competitions.

—[L. A. Downey, H.D.A., Pig Expert.]

Greasy Heel in Horses

"Greasy heel" is an inflammation of the skin above the heels and at the back of the pastern, sometimes extending over the whole pastern and above the fetlock. It is most common in heavy horses with coarse thick legs, more particularly when these horses are kept in damp, insanitary stables, or are long subjected to mud and filth without proper cleaning and grooming.

Swelling and redness of the skin with some itching are the first noticeable symptoms. Later there is an increased secretion from the sebaceous glands of the affected area, over which the hair stands erect, glued together by the oily secretion which has an offensive odour. This aggravates the inflammatory condition and the skin, at first moist and painful, tends to become thickened. If the condition is neglected, there may finally develop wart-like fungoid masses, commonly referred to as "grapes". The hind legs are most generally affected.

The first step in the treatment of the condition is to clip closely all hair from the affected area. The part should then be thoroughly washed, using a mild soap and luke-warm water. A 2 per cent. dettol solution would also be quite suitable. It is essential that the part be then thoroughly dried. Further treatment consists of the regular application of a suitable disinfectant and astringent dressing such as zinc ointment. This should be smeared liberally over the area, covered with gauze and bandaged. This dressing must be renewed regularly until healing is effected. If further washings are necessary, the same precautions regarding thoroughness, both of washing and drying, must be observed.

As a means of prevention of the onset of the condition, the pasterns and fetlocks of all horses should receive particular attention in the grooming each day, especially after working in muddy conditions. General stable hygiene and rational feeding are other factors which will pre-dispose towards freedom from this condition.

[A. R. Grayson, B.V.Sc., Senior Veterinary Officer.]

Bee-keeping

The present time is opportune to replace any worn out queens and if queens cannot be raised in the apiary, provision should be made for the purchase of good young ones from a reliable breeder.

When queens are reared, only the best stock should be chosen, and a good flow of both honey and pollen should be available. Feeding should also be carried out, irrespective of honey flow, as dull weather may cause a reduction in the natural nectar supplies, materially affecting the rearing of the queens.

Strong colonies only should be used to care for the cells, and none carrying an area less than ten full Langstroth frames of brood should be used.

If the bee-keeper is unable to do the grafting, or other allied processes of securing cells, a less intricate method, which is explained below, can be used, but a lesser number of cells will be secured, although, if good feeding conditions are maintained, the cells will be of a high standard. Two weeks previous to the commencement of cell raising, start feeding the colonies daily and at dusk, to prevent robbing. Continue the feeding until cell raising is completed.

Any strong colony can be utilized to raise the cells, but if it is not up to breeding standard, the whole of its brood can be removed and replaced by brood from selected breeding queens. Remove the queen from the strong colony and cell building will commence, and in ten to eleven days, ripe cells should be ready for distribution to the colonies or nuclei requiring them.

When queens or cells are to be introduced to any queenless colony, it is essential that they be fed in preparation for receiving them.

Indifferent results are obtained by introducing queens to bees with empty honey stomachs and dormant chyle glands.

If there is a good honey flow and if ample stores are available to carry the bees through the winter, an increase can be made now. Increases can be made by dividing the strong colonies and introducing queens or cells to the queenless divisions. It is a good policy to leave at least one third of the strong colonies undivided with lots of surplus stores when making an increase, as these can be drawn on for stores and bees if anything unforeseen occurs to the new divisions before they become established colonies.

—[W. A. Collins, Apiary Inspector.]

Poultry Keeping as a Side-line

Poultry keeping may be profitably conducted as an adjunct to mixed farming, fruit growing, dairy farming, and in conjunction with other occupations. A flock of 200 or more White Leghorns or Australorps may be kept for the production of eggs without interfering greatly with other work, and with comparatively little labour and expense. The essentials for success are, that the birds shall come from a good laying strain possessing a high degree of constitutional vigour; that they be given good housing, kept in clean surroundings, and well fed.

Poultry do well on an orchard, the birds being allowed the run amongst the trees during the greater portion of the year. Portable houses are recommended for the purpose. If these are moved a few yards every two or three days, the ground will be well manured, and the birds will be greatly benefited by the shade of the trees, and in their foraging they will rid the orchard of many destructive insects. Under certain conditions, it may be advisable to enclose six or eight fruit trees with wire-netting to keep the birds under control.

Any permanent housing accommodation for the birds should be properly constructed, but need not necessarily be expensive. The houses should be high enough to enable the work to be performed in comfort. They should be properly ventilated, free from draughts, rain proof, and the floor should be high and dry. A concrete floor is safe, sanitary, and permanent. Four to six inches of straw litter should be placed on the floor to keep the birds warm and to provide exercise. This litter should be cleaned out at intervals of not less than three months. At least 4 square feet of floor space should be provided for each bird. If the ground is in a well-sheltered position, it is best to build the houses with a northerly aspect, as this allows the sun to reach the floor during the day.

While successful results have been achieved by keeping White Leghorns confined to the laying houses continually, it has been noted that Australorps do well by being allowed out on free range. When this system is adopted, provision need only be made for roosting accommodation at night.

At the commencement, it is most important that only the best stock should be purchased. It is most essential that the flock should be built up with birds bred from the best laying strains, possessing a high degree of constitutional vigour. Probably the best way to commence would be to purchase day-old chicks from the best commercial farms during the months of July, August, and September. Some farmers, however, undertake to supply pullets when they are well grown.

Correct feeding is an important factor. It is not reasonable to expect poultry to do well if their rations are deficient in quantity and quality, or improperly balanced. Variety of feeding-stuffs are necessary to increase palatibility and to maintain bodily health. A monotonous diet must be avoided. Green food is a necessity on every poultry farm, and a continuous and varied supply must be provided. Not less than 5 to 6 lb. of chaffed green food should be supplied to every 100 adult birds daily. Shell grit should always be available, and a liberal supply of pure cool drinking water should be kept continually before the birds.

Keep the houses clean, and the perches regularly treated with a good disinfectant to prevent the introduction of red mite and other parasites.

—[H. F. Clinton, Poultry Expert.]

AGRICULTURAL COLLEGES

Speech Day Ceremonies

Dookie College

SPEAKING at the Annual Speech Day ceremony at Dookie Agricultural College on 30th January, before a large and enthusiastic gathering of parents and friends of the students, the Minister of Agriculture, the Hon. W. G. McKenzie, said that although some people were sometimes rather critical of politicians, Members of Parliament performed an essential and onerous public duty, often under great difficulty. Such critics should not lose sight of the fact that Parliamentarians were the people's elected representatives and, in criticizing their Members of Parliament, the critics were actually criticizing themselves. The Minister suggested that, if such people were dissatisfied with the present state of affairs, they should themselves take a more active part in the political life of their country. This, he believed, would be the logical thing for them to do, and if he were not mistaken, the critics then would soon be taking a more lenient view of Parliamentarians.

Mr. McKenzie said that, as Minister of Agriculture, he was fully aware of the importance of agriculture in relation to the State's progress. The agricultural community was the backbone of the country, the central pillar on which the stability of the State as a whole depended. The prosperity of the city was merely a reflection of the prosperity of the countryside.

The Minister impressed upon students their responsibility to the rest of the State. As many of them would in due course go on the land as trained farmers, he felt sure the training they had received at Dookie would be reflected in an ultimate improvement in farming practices wherever they were located.

The condition of the paddocks and the size of the College at Dookie had impressed him, the Minister stated, but with the exception of the Gavin Gibson Memorial Laboratory he had found that the College buildings were not up to a desirable standard. It was his intention to impress on Cabinet the urgency of the new College building programme already approved and for which plans had been drawn up and money provided.

It was hoped, the Minister continued, to have at least 150 returned Servicemen trainees in residence at the College this year, although some difficulties had been experienced in obtaining competent instructors for this work.

Mr. McKenzie said that he hoped to visit the College again in the near future as he fully realized that such a large institution could not be adequately inspected in a few hours.

Diplomas were presented to the following students :—

With Honours, Class I.	R. B. Alden
With Honours, Class II.	M. W. Jarvis
	E. H. Miles
	N. M. A. Sayers
	R. Taylor
	I. P. Williams
	B. F. Dowie
	J. D. M. McLeish
	P. B. Johnson
	D. H. Fitzpatrick
Pass	J. R. Gibbs
	K. H. Coulson
	K. Mason
	R. F. Mann
	J. O. Myers
	A. A. Robb
	J. D. Ross-Soden

A. S. McLennan has yet to pass a supplementary examination.

STUDENTS' PRIZE LIST.

Third Year—

Presentation Volume to Captain of College ..	R. B. Alden
Dux of College—Gold Medallist	R. B. Alden
Second Aggregate ..	M. W. Jarvis
First Practical Work ..	R. B. Alden
Farm Records ..	B. F. Dowie

Second Year—

Dux	J. A. Byrne
Second Aggregate ..	R. H. Harris
First Practical Work ..	J. A. Byrne

First Year—

Dux	A. J. Flockart
Second Aggregate ..	G. T. Wright
First Practical Work ..	J. D. Williams

Special Prizes—

Plant Diseases Collection	P. B. Johnson
Botanical Collection ..	J. D. Beresford
Insect Collection ..	J. C. Scougall
Saddlery (Gift of Mr. G. A. Willis)	K. Mason
Best Kept Room ..	P. T. Curwen

Longerenong College

A similar gathering to that held at Dookie took place at the Longerenong College on 30th January, when the Dux Medal and Certificates of Competency were presented.

Pointing out the value of trained men in agriculture, Mr. J. A. G. Campbell, President of Dookie and Longerenong Old Collegians Associations, said that, as the graduates went out into the world they, as representatives of Longerenong College would reflect the training and cultural atmosphere of that institution. The reputation of a college depended largely upon the conduct and ability of its graduates and he was confident that graduates passing out this year would worthily uphold that reputation.

From a College point of view the term had been an excellent one. There had been splendid inter-staff co-operation and a fine staff-student relationship, while everyone willingly co-operated with the Principal in their respective spheres and in the general activities of the community.

STUDENTS' HONOUR LIST.

Dux of College and Winner of Fink Scholarship ..	J. S. Smith
Certificates of Competency were awarded to ..	J. S. Smith G. A. Cox R. K. Rae G. Moreland R. Worden W. T. Harvey R. G. Park K. H. Wearne B. E. Stout W. G. Wright
Dux of Third Session ..	P. M. Hood
Dux of Second Session ..	R. E. A. Strickland
Dux of First Session ..	R. P. Holdenson
Presentation Volume to School Captain ..	J. S. Smith
Practical Work—Seniors	J. S. Smith
Practical Work—Juniors	R. M. Bertram

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture.*

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Number of Birds.
Fellows, J., Yan Yean-road, Plenty	830
Giarrusso, G., Lower Dandenong-road, Braeside. ..	770
Grosvenor, Messrs. E. W. and E. K., "The Haven" Poultry Farm, Springvale South	574
Kostos, D., Cr. Collins and Waverley-roads, Oakleigh ..	1,302
McTighe, C. H., Nar Nar Goon	444
Nichols, Mrs. Ella M., "All Red Poultry Farm", Yan Yean	543
Salmond, J. B., "Peerless" Black Leghorn Yards, Deer Park	245
Wohlers, S., Box 17, Jung	261

SAVING TOMATO SEED

By
BASIL P. KRONE,
Instructor in Tomato Culture

WHEN saving tomato seed mark plants which show good cropping habits, good shape and quality fruit, and freedom from disease, and allow the fruit to ripen thoroughly before harvesting. This is preferable to selecting the occasional nicely-shaped tomato as is frequently done, because some of those nicely-shaped tomatoes may not inherit other desirable characteristics. It should be pointed out that a flat-round variety frequently becomes more oval late in the season, and an oval variety sometimes elongates, therefore this feature is misleading.

After ripening, the selected tomatoes should be permitted to take on a slightly wilted appearance, but if wilting does not occur, each fruit should be cut in half before actual decay sets in and the pulp squeezed into a vessel and allowed to ferment, which will require two or three days, according to the atmospheric conditions. When fermentation commences, the good seed will sink to the bottom and the rubbish may be easily poured off.

To do this, fresh water should be added (but not until the pulp has fermented); the contents thoroughly stirred, and the residue poured off.

When large quantities of seed are required and tomatoes are fermented in buckets or barrels, it is most important that the pulp does not ferment longer than necessary, otherwise the seeds will commence to germinate in the pulp and their viability will be ruined. The correct stage to wash the seed can be decided by watching for the "ferment to break"; this will take place when the tomato juice, which is "water white", separates from the mucilage, and may be observed by stirring the pulp from time to time. Several washings will produce nice clean seed, which should then be disinfected by soaking it for approximately five minutes in a 1 in 3,000 solution of bichloride of mercury and finally rinsing it in fresh water many times.

The easiest method of using bichloride of mercury is to procure it in tabloid form from a chemist, and dissolve one tabloid in three pints of warm water. The *solution is extremely poisonous*, so that care must be taken. The solution will quickly attack a metal vessel, therefore china or glassware should be used. Do not make the solution stronger than 1 in 3,000. Tests have shown that germination has been delayed for periods up to ten days with some varieties when a strength of 1 in 1,000 was used. The seed is then spread on calico, or other clean material, to dry quickly. Frequent raking during the drying process will prevent lumps of seeds forming. Do not attempt to dry tomato seed on rough or fibrous hessian, as the fine particles in the material may severely mat the seed together and spoil the sample.

Another good treatment is to disinfect the seed by means of dry dusting with redispersible copper oxychloride. Approximately ½ oz. is required per pound of seed.

Method of Disinfection.—Place the seed and the required amount of dust in a convenient, tight-lidded container and shake vigorously for several minutes to ensure even coating of every seed. Screen out the excess dust and store the seed in a dry place until it is required.

Tomato seeds are very viable, and will germinate even after years of storage. It is not a good practice to keep them too long, because the seed coat becomes hardened, and the germination period may be delayed for several days.

The average number of tomato seeds per ounce may be of interest. Actual counts have revealed the following:—

Aust. Large Red	8,500
Burwood Wonder	10,100
Crimson Bell	9,800
Eccles Surprise	10,700
Grosse Lisse	10,000
Kondine Red	10,800
Market King	11,300
Orange Prolific	9,000
Pale Leaf	9,000
Potentate	11,500
Pritchard	10,000
Prosperity	9,500
Recruit	9,000
Red Marhio	10,000
Rouge de Marmande	11,000
Rutgers	11,000
South Aust. Dwarf	10,000
Tatura Dwarf Globe	10,000
Tatinter	9,500

For practical purposes growers should provide 1½ to 2 oz. per acre. This amount of seed would make provision for non-viable seed and also for plants which are not suitable for transplanting.

Number of cases of tomatoes required to yield 1 lb. of seed:—

Aust. Large Red	4–1½ cases
Burwood Wonder	4–4½ cases
South Aust. Dwarf	4–4½ cases
Orange Prolific	4–4½ cases
Pale Leaf	4–4½ cases
Grosse Hisse	6½–7 cases
Eccles Surprise	6 cases
Red Marhio	6 cases
Break o' Day	6 cases
John Baer	5½–6 cases
Chalk's Early Jewel	5½–6 cases
Earliana	5½ cases
Tatura Dwarf Globe	4–4½ cases
Tatinter	4–4½ cases

PREPARE NOW FOR PLANTING TREES

Now is the time to make plans and prepare for planting trees in the late autumn, winter, and early spring. In every district, even in forested areas, there is some scope for further planting. Most districts are woefully short of trees and few projects are more deserving of public support than the State-wide community tree-planting scheme which is now being organized by the "Save the Forests" Campaign.

The first step to be taken in a locality is to form a district committee. The municipal council is asked to take the initiative in forming such a committee and to be represented on it. Most councillors will have had the experience, however, of sponsoring movements and then finding that the work is all left to them and their officers. Offers of support by responsible citizens may induce councils to take up this important work. Where a committee has already been formed, it may be strengthened by adding experienced tree-planters and representatives of organizations willing to take part in a community planting effort.

The second stage is to make a survey of the tree-planting needs of the district. Municipal councils, the Forests Commission, the Lands Department and the Country Roads Board are all supporting the tree-planting campaign and can be relied on to help as far as lies in their power.

The third stage is to decide on the particular project to be undertaken this year. Trees may be obtained free of charge on certain conditions, particulars of which may be obtained on application to the undermentioned address.

Advice on the best trees for the district may be sought from successful local growers. Where a clear space is available, ploughing and harrowing prior to the planting will contribute greatly to the success of the young trees. Further information on this year's planting may be obtained from the Honorary Organizing Secretary, "Save the Forests" Campaign, 314 Collins-street, Melbourne, C.1.

["Save the Forests" Campaign Committee.]

THE SEED POTATO CERTIFICATION SCHEME

By G. H. MATTINGLEY, Potato Expert

A crop of Certified Seed Potatoes in the Beech Forest district

DURING the years in which the Seed Potato Certification Scheme has been in operation in Victoria, the aim has been to identify those crops which, by virtue of their trueness to type and freedom from disease, are eminently suitable for seed purposes.

Potatoes are subject to many forms of disease, caused principally by parasitic fungi, bacteria and the viruses which are responsible for the degeneration of potato varieties. Viruses are the smallest disease agents known, and, for practical purposes, those affecting potatoes are best described as "communicable poisons" which pass from one generation to the next in the seed tubers.

The successful Certified seed grower must be familiar with the nature of potato diseases and their means of transmission in order to know how to prevent and eradicate these troubles. Most of the virus diseases only show symptoms in the foliage, and although infection results in reduced yields, the tubers do not show any evidence of disease. These diseases can be controlled only by the removal of infected plants from the crop. Thorough and efficient "rogueing" or removal of undesirable plants is one of the most important factors in the maintenance of a healthy and vigorous seed stock.

The production of Certified seed potatoes should be confined to those localities where climatic and soil conditions are suitable for the growing of tubers of good quality and free from disease. In addition, the climate should be such as to allow any plants which may be virus infected to show full development of the disease symptoms so that they may be eliminated.

In fostering this voluntary scheme of seed potato certification, it is not the intention of the Department of Agriculture that every purchaser of certified seed should become a producer of such seed. On the contrary, it should be

recognized that the production of seed crops of high standard is the distinct prerogative of certain areas having climatic and environmental advantages. The object rather is to enable growers to locate the best seed obtainable for their commercial crops and to help keep to a minimum the serious effects on yield of the various plant diseases.

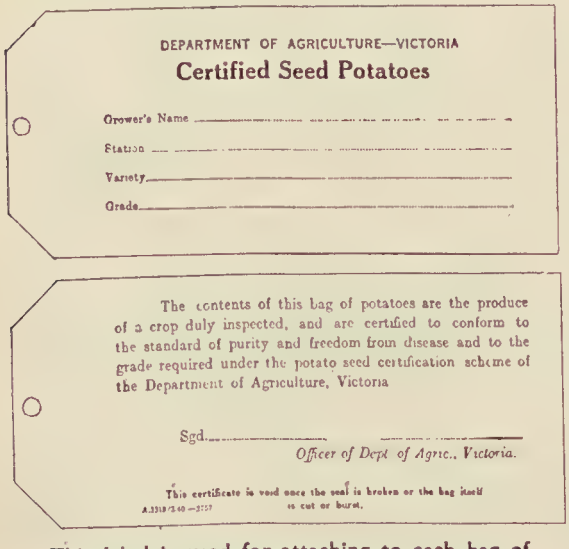
Application for Certification

Growers desiring to enter their crops for certification should make application to the Department of Agriculture, Melbourne, C.2, giving all necessary particulars regarding the crop, and enclose with the application the registration fee of 10s. Applications close on 31st August of each year.

At the time of application, each grower is required to send to the Department for a comparison trial, a representative sample of 14 lb. of seed stock from which the crop submitted for certification is being grown. In the comparison trial plots, all samples are grown under identical and favorable conditions so that the relative health and vigour of the different lines may be compared. The plots grown from these samples provide a reliable check upon the parent crop and are critically examined from time to time during the season.

Seed

All crops entered for certification must have been planted with Certified seed. If it is desired to submit uncertified stock, the line must maintain the required field standard for two successive seasons before it can be certified.


DEPARTMENT OF AGRICULTURE—VICTORIA

Certified Seed Potatoes

Grower's Name .....

Station .....

Variety .....

Grade .....

The contents of this bag of potatoes are the produce of a crop duly inspected, and are certified to conform to the standard of purity and freedom from disease and to the grade required under the potato seed certification scheme of the Department of Agriculture, Victoria

Sgd. .....

Officer of Dept. of Agric., Victoria.

This certificate is void once the seal is broken or the bag itself is cut or burst.

A.2318/3.40—2757

This label is used for attaching to each bag of Certified seed potatoes.

Isolation

Owing to the means by which virus diseases spread in the field, namely by insect carriers or vectors, it has been necessary to insist upon some degree of isolation of crops intended for certification. In order to prevent, as far as possible, this spread of the disease from affected to healthy crops, those crops intended for certification must be at least one chain removed from any crop of potatoes not sown with Certified seed, or any crop of the Brassica family (turnips, swedes, cabbages, cauliflowers, rape, mustard) which is also a host of the aphis which carries virus diseases.

Rotation

In some districts the growing of several crops of potatoes in succession on the same land is followed as a part of the local farming economy. This practice, however, invariably leads to a proportion of volunteer or self-sown plants appearing in the succeeding crops.

There are two aspects to the question of self-sown plants, the most important being that these plants are likely to carry a higher proportion of virus infection than the bulk of the crop from which they arose. Self-sown plants, therefore, may constitute a serious menace to the health of the crop in which they appear. Again, if the previous crop were of another variety, the possibility of mixing the two cannot be overlooked. From the standpoint of seed certification, foreign varieties or "rogues" are highly undesirable. For these reasons no crop grown on land which grew potatoes during the previous four years will be accepted for certification unless the inspecting officer is satisfied that any danger arising from the causes outlined above has been eliminated.

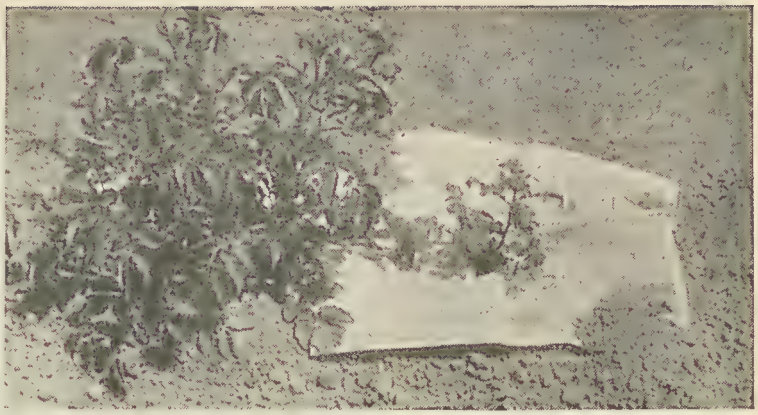
To minimize possible attacks of tuber-borne scab diseases, it is strongly recommended that all seed used for sowing certified crops be dipped in some effective fungicidal solution such as formalin, corrosive sublimate or organic mercury compound.

Field Inspections

In order that field inspections can be arranged, growers should notify the Department when planting has been completed. Crops are examined at least twice in the field while growing. The first inspection is made approximately eight weeks after the average planting date for the district and the second some four weeks later. At the first inspection, if there should be any evidence of disease showing on the plants, this is pointed out to the grower,

who is required to remove the affected plants from the crop before the second field inspection takes place. This inspection coincides with flowering time and shows whether previous "rogueing" has been done effectively and gives opportunity to check varietal purity.

On passing the final field inspection, the grower is officially notified that his crop has been accepted for certification, subject to tuber inspection. A list of growers whose crops have thus been provisionally certified is published in the April number of this Journal each year.



The plant on the right shows symptoms of Rugose Mosaic. Compare this specimen with the healthy plant on left.

FIELD INSPECTION STANDARDS FOR CERTIFIED SEED POTATOES.

—	First Inspection.	Final Inspection.
	%	%
Virus diseases	5	2
Other diseases	5	2
Varietal admixtures (including bolters)	1	½

Not more than 7 per cent. undesirable plants collectively, are allowed on the first inspection and not more than 3 per cent. on the final inspection. Crops showing an undue proportion of misses and unthrifty plants will not be accepted.

Leaf showing Mild Mosaic.
[After *U.S. Dept. Agric. Cir. No. 271.*

Grading

Certified seed potatoes must comply with the grade standard for "seed" potatoes as laid down in the Seventh Schedule to the *Fruit and Vegetables Act* 1928. This requires that the potatoes be sound, practically free from insect or fungous diseases and practically free from dirt or other foreign matter. The tubers shall be packed in packages legibly branded with the name of the variety and the words "Seed Potatoes". The diameter of the tubers shall be not less than 1½ inch.

During late years, five grade sizes were provided to suit the requirements of buyers of Certified seed. In practice it has been found that these grades are rarely used and that the most common way in which Certified seed potatoes are sold is in the "run", i.e., all tubers from 1½ inches upwards.

It is pointed out that the quantity of Certified seed available is increasing each season, therefore, growers must look to the time when Certified seed sales are made, not only on reputation, but on an attractive presentation of the product. With this in view, it is suggested that Certified seed potatoes be graded into the following two grades :—

	Minimum.	*Maximum.*
Seed ..	1½ in. or 1½ oz.	2¼ in. or 3½ oz.
Large Seed	2¼ in. or 3½ oz. upwards.	

No maximum size is indicated for large seed, but growers are urged not to pack tubers which could reasonably be classed as too large for seed purposes.

It is suggested that the bags in which Certified seed potatoes are packed should be either new, or sound, clean once-used sacks, free from holes and patches and which have not been used previously for potatoes or for any material likely to be injurious to potatoes, such as fertilizers. The bags should be clearly branded in 2 inch letters with the name and address of the grower, the name of the variety and the grade.

Sealing

On application from the grower, official tags and seals will be issued for each bag of Certified seed potatoes to identify the product. Tags are placed on the sewing twine about the centre of the bag. Both ends of the twine are sealed with lead seals which are stamped by the certifying officer when the parcel passes the final tuber inspection. A sealing fee of 2s. per ton or part thereof is charged on all potatoes sealed. It should be noted that this charge is over and above the ordinary inspection fees.

The term "Certified" must only be applied to seed potatoes harvested from a provisionally certified crop and packed in sealed bags bearing the official label.

DESCRIPTION OF VIRUS DISEASES

The main virus diseases affecting Victorian potatoes are mild mosaic, rugose mosaic and leafroll. The spread of these diseases in the field is almost in direct relationship to the local population of certain species of aphids. These insects are capable of picking up the virus when feeding on diseased plants, carrying it in their bodies, and injecting it into the healthy plants on which they feed.

Tubers from infected plants carry the disease, and when planted produce disease symptoms. These infected plants must be rogued from crops intended for certification as soon as detected, so as to prevent, as far as possible, the further spread of the disease in the crops.

There is also the latent virus or virus "X", which almost universally infects commercial varieties in Australia. On its own, virus "X" produces little or no definite symptoms, but in combination with the other virus types produces the symptoms described below.

Plant affected with Leaf-roll virus.

[*After Eire Dept. Agric. Bulletin*

Mild Mosaic is the general name given the disease caused by virus "A" in combination with virus "X". It is characterized by a more or less severe mottling, or the production of small light-green spots on the leaves, and may be accompanied by some reduction in size of the leaflets. Some distortion or crinkling of the surface occurs as well, owing to the unequal growth of the light and dark green areas in the leaflets. Affected plants die off prematurely with the vines falling outwards. Hot weather and dry conditions mask the symptoms, making recognition difficult under these circumstances. The yield from affected plants is reduced. The Carman group is very susceptible to this disease, while Snowflake, Up-to-Date and the American varieties Katahdin and Sebago are immune.

Rugose Mosaic is caused by virus "Y" plus virus "X". In the season of infection small brown specks and rings of dead tissue appear on the leaves which shrivel up and fall, leaving only the growing tip. This condition is known as "leaf-drop streak". The secondary and permanent manifestation of the disease takes the form of severe distortion of the leaves with the tip and edges curled down, accompanied by a distinct mottle. Affected plants are dwarfed and mature early with characteristic falling outward of the vines. The yield may be so reduced as to be almost negligible. The Carman group is particularly susceptible to rugose mosaic: Up-to-Date is subject to it to a lesser degree: Katahdin is slow to contract the disease, while Snowflake is very resistant under average farming conditions.

[*Continued on page 117.*

STRANGLES IN HORSES

By G. NICOL, B.V.Sc., Veterinary Officer

STRANGLES is a highly infectious disease of horses which often makes its appearance when large numbers of horses are brought together, as for example in army camps, horse lines, or large stables. It is characterized by a catarrhal condition of the membranes of nose and throat with enlargement of adjacent lymph glands and abscess formation.

The disease is due to infection by a specific germ (*Streptococcus equi*) which may be isolated from the pus associated with the swellings and discharges.

Horses which have recovered from an attack of strangles may be a source of infection to other horses under certain conditions. The discharges from an affected animal are a potent source of infection as they contain the causal organisms in a virulent form. Contamination of feed bags, mangers, &c., results in exposure of other horses to infection. Drinking water likewise is easily contaminated and is probably a major factor contributing to the rapid spread of the disease through a stable. Contributing factors are badly ventilated stables, close stabling, such as in sea voyages, and chill.

Symptoms

The severity of the symptoms depends on the virulence of the infection, the degree of resistance of the horse itself and the amount of infection to which the horse has been exposed. In typical cases the horse goes off his feed, is lethargic, and hangs his head with eyes dull and partly closed. A watery discharge is first in evidence from the nostrils and later the pus which has accumulated begins to come away through the nostrils; a similar discharge at first watery and then containing pus may also be in evidence from the eyes.

Abscess formation is apparent from the swellings which usually occur about the throat although on occasions they may occur almost in any part of the head and less frequently in other sites such as the abdomen, side of the neck, shoulder, &c. The affected animal swallows with difficulty, due to the inflammation of the nose and throat membranes. Food may remain in the mouth in a semi-masticated state, and fluids may be noticed to return through the nostrils. The head is usually held stiffly extended, and, associated with abstention from food, loss of condition is inevitable.

Course of the Disease

The period of incubation for strangles is three to eight days. Mild cases may simply show a slight nasal discharge, slight cough, and evidence of a sore throat without further development. In severe cases swallowing is painful and difficult, the breathing is affected and abscess formation occurs. The pain occasioned the horse may be extreme, and suffocation is likely where abscess formation causes pressure on the windpipe.

Nasal secretions or pus from an abscess may be carried to the lungs and set up a bronchitis or pneumonia. Secondary infection may also occur in the abdominal lymph glands followed by a fatal peritonitis.

Recovery from an attack of strangles confers quite a degree of immunity which varies from one year to, in most cases, the life of the animal. A common sequel to infection is a chronic inflammation of the sinuses of the head, evidenced by a nasal discharge which may persist for a long time.

Prevention

Management plays an important part in preventing a mass spread of strangles through a stable. Any horses showing a mild catarrhal condition should be given separate feeding and watering facilities until the condition clears up. Often, however, despite all precautions, many horses will be in the incubation stages of the disease before the first suspicious case is noted. The use of strangles vaccine may be warranted in some circumstances. The efficiency of vaccination would appear to be associated with the virulence of infection to which vaccinated horses are subsequently exposed.

Treatment

In mild cases showing a catarrhal condition only, attention to diet, administration of a purgative such as 2 to 3 oz. of sodium sulphate, rest, or light exercise, and removal of any accumulated discharge about the eyes and nostrils are important considerations. Where

there is interference with breathing, inhalations of carbolic acid or creolin are useful. These are used at the rate of one teaspoonful to a bucket of hot water, treatment being repeated several times daily. Other inhalants include eucalyptus oil, turpentine and Friar's balsam. Nasal inhalant ointments placed in the false nostril are sometimes successful. To relieve the cough which is often present, a mixture of chlorate of potash 2 oz., camphor 2 oz., extract of belladonna 1 oz., and treacle 8 oz. should be compounded and applied to the back of the tongue, at the rate of 1 tablespoonful three times daily.

Where abscess formation is in evidence, the swelling should be painted with weak tincture of iodine, and incised with a suitable knife, which has been previously sterilized by immersion in 1 per cent. lysol for ten minutes. The abscess should be expressed and then irrigated with 1 per cent. lysol.

After Care

A period of 4 to 6 weeks' convalescence should be allowed, as too early a return to work may result in complications such as pneumonia. During this period light exercise only is allowable and particular attention should be given to nursing, irrigation of the wound, and rest. In the case of valuable horses, drugs such as soluseptasine may be employed by the Veterinary Practitioner to control any untoward complications.

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86	Middleton, J. A.	Longwarry North	70
Armstrong and Son	Wangaratta	105	Murray, M. G.	Lima	26
Ballarat Orphanage	Ballarat	133	McIntosh, J.	Merrigun	35
Banyule Stud Pty. Ltd.	Wangaratta	55	McNabb and Son, G. A.	Irrewillipe East	159
Beggs, A. R.	Beaufort	112	Nancarrow Bros.	Kerang	48
Black, I. S. Estate	Mount Noorat	60	Noonan, G.	Benalla	35
Carne, W. J.	Pakenham Upper	27	Noonan, Mrs. S. A.	Benalla	51
Clark, W. J.	Monomeith	140	Northcote Children's Farm	Bacchus Marsh	48
Cowan, G. L. S.	Bacchus Marsh	59	Onley, W. H.	"Glenholme," Caldermeade	76
Cribbes, T.	Wangaratta	39	Parker, Mrs. L. M.	Tallarook	67
Deering, J. T.	South Wangaratta	86	Payne, A. E. T.	"Yarra View," Lilydale	67
Dennis, Mrs. A. A.	Frankston	23	Payne, T. E. N.	"Woodburn," Kilmore	44
Dookie Agricultural College	Dookie	92	Poole, M. A., and D.	Caldermeade	120
Everist, F. R.	Tyabb	20	Poole, M. A., and D.	Yannathan	104
Foletta, G. G. and Son	Buxton	120	Potter, W. J.	Longwarry North	130
Geelong Grammar School	Corio	78	Powell, T. S.	"Carellen," Mansfield	43
Gorman, A. W.	"Cathcart," Alexandra	57	Reid, Mrs. B., Estate of	Bundoora	74
Griffin, G. W.	Gladysdale	50	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Griffiths, J. G.	Benalla	151	Roe, Thomas H. P.	Cobram	27
Gross, Mrs. G. F.	Green Lake	21	School of Horticulture	Burnley	6
Hamilton, A.	Flinders	64	State Experiment Farm	Rutherglen	47
Henry, J. A.	Warrnambool	45	State Research Farm	Werribee	245
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	55	Stephens, Dr. F.	Vermont	32
Jakobi, L. W.	"Granada," Yannathan	89	St. Joseph's Home	Sebastopol	53
Johnson, F. G.	Horsham	11	Vagg, T. R.	Officedale	40
Lady Talbot Milk Supply Co.	Cranbourne	513	Vagg, E. J.	Leongatha	48
Lawrence, P. H.	"Rainga," Tarrawarra	83	Warnock, J. A.	Benalla	76
Light, D. T.	Noradjuha	8	Waterhouse and Son	Pakenham	55
Longerenong Agricultural College	Dooen	42	Wells, W. G.	Caldermeade	67
Maloney, P. J.	Tongala	66	Woodyer, P. A.	Mornington	19

In addition to the above-mentioned herds there are 921 commercial dairy herds containing 24,470 head of cattle which may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

There are also 311 herds in which 10,860 head of cattle have passed one test, and may be considered, therefore, to be in the process of becoming tubercle-free herds.

By H. F. Clinton, Poultry Expert

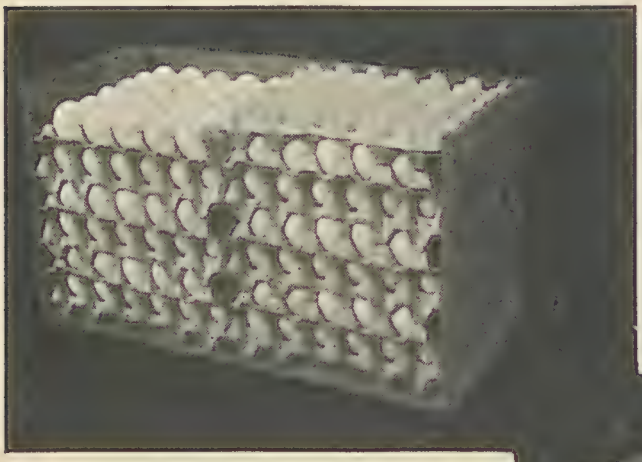
SUCCESS in marketing of any product is dependent, largely, on the maintenance of a high standard of quality. This is particularly true of eggs, for eggs of poor quality appreciably affect both demand and price. Eggs are not all of the same quality when laid, and some eggs, though of good quality when new-laid, deteriorate much more quickly than others, even when stored under the same conditions.

The testing of eggs for quality on a commercial basis is done by candling, that is, the examination of the egg shell and its contents in front of a strong ray of light. The quality is assessed according to the translucence of the egg when held before the light, and in expert hands the method is generally regarded as extremely accurate. The chief points which can be noted in candling are :— texture of shell, size of air space, visibility and condition of yolk, condition of white and presence of foreign bodies. By candling, it is comparatively easy, even for the inexperienced, to detect small cracks, foreign bodies, and size of air space, but the finer differences of internal quality can be judged only by a highly skilled worker. The defect known as watery white is certainly difficult to define in some cases. The true watery white egg is one in which the white runs all over the pan when opened for cooking. It is sometimes due to bad packing and rough handling in transit. It should be realized that this condition of the white is sometimes found in new-laid eggs and also in stale eggs with a thin and watery white, especially during the hotter months of the year.

Quality and Size

The price received for eggs depends upon quality and size. Egg size is governed by breeding, feeding, and other factors, and it should be the aim of beginners to secure foundation stock from a recognized laying strain. Good results cannot be produced from indifferent fowls badly fed, and in this connexion, it must be emphasized that a hen when laying is subjected to a heavy strain and must be well fed on a properly balanced ration if best results are to be obtained. The quality of eggs is affected by the feeding of unsuitable foods, by fertile eggs germinating during the hot weather, and by holding the eggs too long before being despatched to market. The eggs should be collected at least twice daily, and packed when cool in clean fillers and flats. Keep the eggs in a cool and well ventilated place free from direct draughts, in order to avoid excessive evaporation, and market twice weekly during the hot weather. Eggs should be stored in clean rooms away from produce or goods which emit odours. Deterioration of the contents of weak-shelled eggs is more rapid, because the poor quality shell offers less resistance to evaporation

and because bacteria and abnormal odours more easily penetrate such shells when soiled. Eggs that are clean and of a good shell texture realize higher prices. Ample nesting accommodation should be provided, and the nests and nesting material should be clean and dry.



Eggs packed in Keyes egg trays.

Packing for Transport

The development of primary industries in Victoria has been accompanied by problems as well as by profits and benefits. Not the least of these problems is that associated with the elimination of waste in the handling and transport of eggs, which, being of a particularly fragile nature, demand special care at all times. The problem of better packing and safe transportation is one which should engage the attention of every person associated with the poultry industry. Quite a number of eggs are broken during packing, handling, and transport, and most of these breakages are due principally to faulty packing or bad handling. Producers should not be expected to protect their eggs against unreasonable transportation shocks; but carriers and others cannot prevent breakages of eggs which are packed in inferior containers. Eggs should be packed with the large end up. Long eggs are usually crushed or cracked in packing, and, therefore, no egg should be packed if it stands above the top of the filler. Generally speaking, carefully graded and properly packed eggs reach the market without breakage, and an unblemished pack of eggs naturally brings a higher price than one containing cracks and soiled fillers.

In packing eggs, care should be taken to see that the case and fillers are clean and in good condition. Ordinary flats and pads of wood wool have been used, but the type of flat known as the cushion or cup flat, which eliminates the use of chaff, wood wool, or any other substance to be placed in the case, is giving excellent results. When using cushion or cup flats, two flats are placed at the bottom of the case, one with the cup downwards and the other with the cup upwards. The filler is then placed on the flat and the compartments carefully filled with eggs. If the eggs are dropped in, they will become cracked, and probably develop a leakage during transit. Another cup flat is placed in the case with the cup upwards, and the packing continued until the case is full, and finally, one cup flat is placed on the top filler before the case is closed.

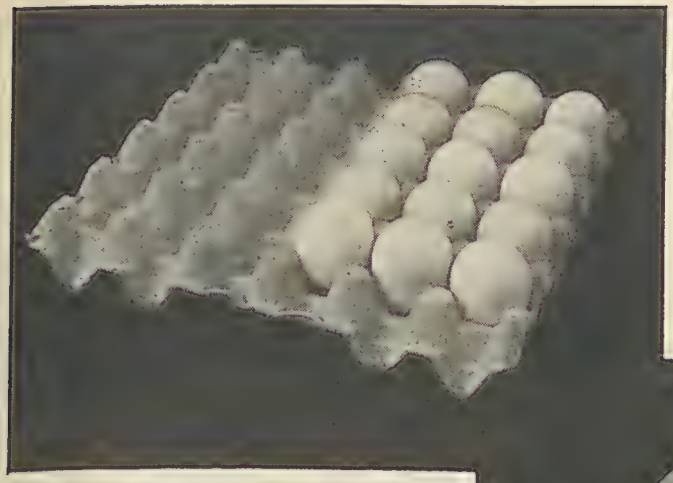
Another method of packing eggs. Cushion or cup flats and fillers are used.

There is also another type of filler on the market, known as Keyes egg trays. This type has been used extensively for the export trade and has proved successful. It is also being used for the local trade. The 30-dozen case has been found to be the most economical for handling, packing, and transport.

Cold Storage of Eggs

It is possible that no one factor has so greatly benefited the poultry industry as the cold storage of eggs.

If it were not for the cold storage of the surplus eggs produced in the spring and early summer, prices for eggs during the winter would be so high



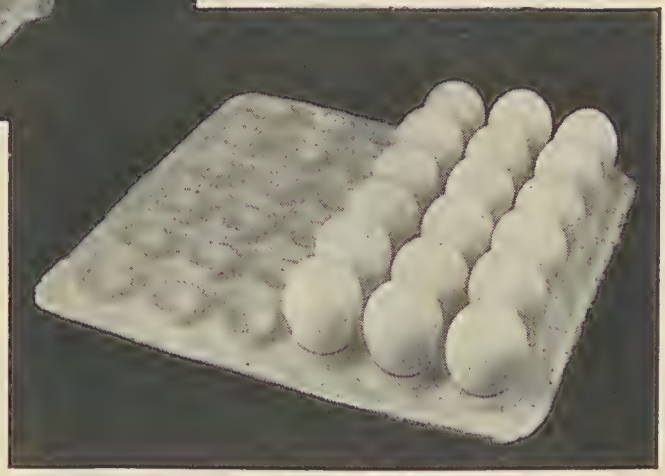
The Keyes egg tray.

that none but the wealthy could afford to buy them. The bulk of the people would be debarred from the use of one of nature's best foods.

The producer benefits because during the time of high production thousands of dozens of eggs are taken off the market when prices are low, and this helps to stabilize the prices he receives.

Unfortunately, a section of the people is of opinion that, once an egg has been placed in cool store, it becomes an inferior article, and should not be sold in shell, but should be converted into egg pulp. Nothing is further from the truth.

Management has advanced with the times, and it is now possible to hold many classes of foodstuffs in perfect condition over long periods. As far as eggs are concerned cold storage has been brought to a very high standard of efficiency. It must be remembered, however, that by cool storing eggs, miracles are not performed. It does not make stale eggs fresh, or dirty eggs clean, or small eggs large, or cracked eggs sound; therefore, operations should be confined solely to sound, clean, new-laid, large eggs, and eggs that have not been washed by a washing machine.



A cushion or cup flat.

Provided eggs of this description are placed in store and the correct temperature maintained, they can be held for months, and when taken out will be in perfectly satisfactory condition; and no evidence has yet been produced that, so far as food value is concerned, cold stored eggs deteriorate in any way.

THE SEED POTATO CERTIFICATION SCHEME (*continued from page* 112).

Leafroll is a growth abnormality caused by the leafroll virus. The primary symptoms, i.e., those which show in the year of infection, are a rolling inwards of the topmost leaves of the plants. This should not be confused with the condition caused by rhizoctonia. Secondary leafroll, that which occurs in succeeding years, results in a thickening and rolling inwards of the lower leaves after the plant is about 4 weeks old. The thickening and rolling gradually progress until the whole plant may be affected and has a stunted, erect appearance, is yellow-green in colour and is harsh and brittle to the touch. Substantial reduction in yield occurs, although affected plants mature normally.

All the commercial varieties grown in Victoria react to infection with leafroll virus, Up-to-Date being the most susceptible variety.

THE ANALYSIS OF SOILS

Directions for Taking Samples

By W. R. Jewell, M.Sc., Agricultural Research Officer

CHEMICAL analyses of samples of Victorian soils are undertaken for farmers by the Agricultural Chemist, for which a fee of 10s. 6d. per sample is charged. Where advice can be based on relatively simple quantitative tests, together with a qualitative examination of the soil, the fee is 4s. per sample. Simple individual determinations (as for salt content or reaction) are conducted for a fee of 2s. per sample.

To obtain a sample which is representative and suitable for analysis, the following directions should be observed :—

(1) With a spade, make a small clean hole reaching to the full depth of the surface soil.

(2) Take out a perpendicular slice of soil from the surface to subsoil and place in a clean bag or box.

(3) To obtain a fair average sample, repeat these operations at six spots at least, distributed over the area being sampled, the soil from each sampling being placed in the bag or box.

(4) The soil so taken should then, without delay, be turned out on a clean board or flagstone and thoroughly mixed. Place about two pounds of the well mixed sample in a clean container, on which identification marks are made, including the depth to which the soil has been sampled. Stones, except large ones, should not be removed from the sample.

(5) When sampling, as described above, the sample should be taken from the surface to the line of change between soil and subsoil. Where the top soil is very shallow or where there is no definite change to subsoil, a depth of eight inches may be adopted. In cases of doubt with shallow soils, &c., it is preferable to take samples of each different layer or stratum of soil and leave it to the agricultural chemist to mix them.

(6) If it is desired to submit a sample of the subsoil, a similar procedure is adopted, the subsoil sample to be taken from each hole after the top soil sample has been removed.

(7) If the soil in different parts of the area is manifestly of different qualities, samples of each kind should be forwarded.

In forwarding samples the following information must be supplied :—

(1) The depth of the samples taken ; (2) where the land is situated ; (3) whether the soil is from level country, swamp, alluvial land, or from hill country—if from hill country the aspect should be stated ; (4) if it is virgin soil, whether it is forest or open country—if forest, the kind of trees and undergrowth should be mentioned ; if open country, the kind of grasses growing on it ; (5) if it is in cultivation, how long it has been cultivated, what was the last crop, when and what was its last manuring, what has been the manuring and the rotation of crops in previous years, what has been the yield per acre, and what is considered a good yield in the district ; (6) whether the land is drained or not ; (7) what is the nature of the climate and seasons of the district, and what kind of weather prevailed for the few days previous to taking the sample ; and (8) what lies below the subsoil.

In addition it is necessary to state what special information it is desired that the analysis should furnish.

The samples, when obtained in the manner indicated, should be forwarded to Agricultural Chemist, State Laboratories, Gisborne-street, Melbourne, C.2, with carriage prepaid, the name and address of the sender being written on the parcel.

ABNORMALITY IN HEN EGGS

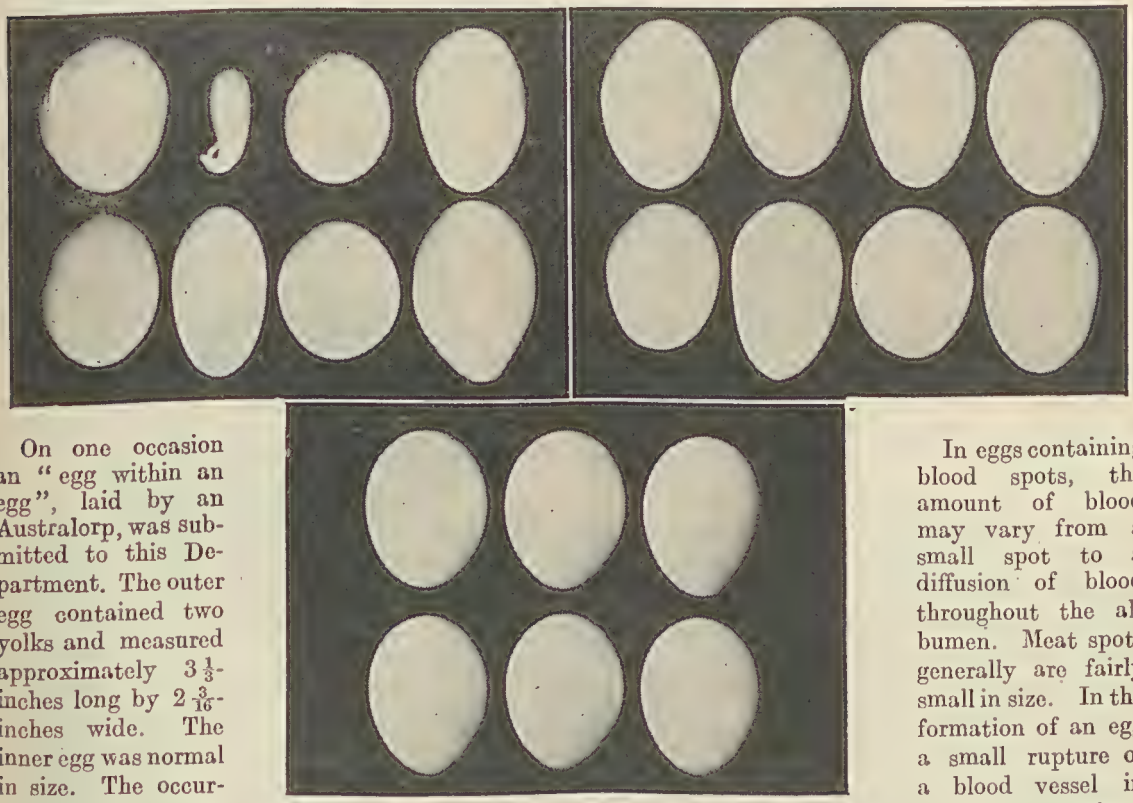
By

H. F. CLINTON, Poultry Expert

ABNORMALITY in eggs takes many forms. There are double-yolked, triple-yolked, and even quadruple-yolked eggs. Some eggs are soft-shelled, others contain blood or meat spots, while sometimes even a yolkless egg will be laid. There is no limit to the number of abnormally shaped and sized eggs hens will lay, often with the most extraordinary excrescences on the surface of the shell.

Large eggs are frequently laid by pullets when first commencing to lay. These eggs are often found to contain two yolks, and are commonly referred to as double-yolked eggs. Triple- and quadruple-yolked eggs, however, are comparatively rare. Double-yolked eggs are due to improper functioning of the ovary, a condition which usually corrects itself in pullets after the first few eggs have been laid.

Left and Right—Abnormally-shaped eggs. Compare these with the normally shaped eggs in the lower picture.



On one occasion an "egg within an egg", laid by an Australorp, was submitted to this Department. The outer egg contained two yolks and measured approximately 3 $\frac{1}{3}$-inches long by 2 $\frac{3}{16}$-inches wide. The inner egg was normal in size. The occurrence of the abnormality may be explained as follows:— an egg is almost ready to be laid; then, owing to a nervous condition or some other cause, the egg is returned some distance back along the oviduct. In passing once more down the oviduct, another layer of albumen and shell is formed around the normal egg, so completing the freak specimen.

In eggs containing blood spots, the amount of blood may vary from a small spot to a diffusion of blood throughout the albumen. Meat spots generally are fairly small in size. In the formation of an egg a small rupture of a blood vessel in the ovary sometimes occurs, causing blood to enter the egg contents. Usually the blood forms a small clot close to the yolk. If the quantity of blood is considerable, it diffuses through the albumen, giving the entire egg a reddish tinge. Both conditions may be readily detected by holding the egg before a candling light.

A triple-yolked egg.

Meat spots are commonly explained as being small pieces of tissue torn away during the course of egg formation and mixed with the egg contents. They appear, on candling, as brownish spots, but meat spots should not be confused with the chalazae. The chalazae are twisted strands of albumen which anchor the yolk in the thick albumen and are present in every egg, but vary in size in different eggs. In candling, they appear as twisted white cords.

Soft-shelled eggs may be due to a shortage of shell-forming material such as shell-grit, but if grit is kept continually before the birds and soft-shelled eggs continue to be laid by an occasional bird, this may be due to the improper functioning of the oviduct, a condition which usually corrects itself after a short time.

Abnormally-shaped eggs are also due to a physiological weakness in the oviduct, expecially in the shell-forming section.

The ideal eggs for hatching purposes should be of good size and weigh not less than 2 ounces, but not much heavier. They should be of good shape, with smooth and even texture of shell, and free from abnormalities of all kinds. The candling process will enable eggs with thin and porous shells and other faults to be easily seen and discarded. Small eggs generally cause dissatisfaction, and tend to lower the average price of all eggs sold, resulting in a loss to the poultry farmer. Serious consideration has to be given to the operations of breeding, feeding and general management if the average quality and size of eggs are to reach a high standard, which is necessary if the best average price for all the eggs produced on the farm is to be obtained.

The x-ray discloses a normal-shaped egg inside an exceptionally large egg.

for maintenance). The feeding standards given by Prof. J. A. S. Watson from experiments conducted at the School of Rural Economy, Oxford, are more applicable to Australian conditions.

Table XII. shows the food requirements of young sheep per 100 lb. live-weight for growth and fattening as given by Watson and for maintenance as calculated from work by Thomas.

TABLE XII.—THE FOOD REQUIREMENTS OF SHEEP, PER 100 LB. LIVE-WEIGHT.

—	Starch Equivalent per Week.
	lb.
Maintenance (only)	4·0
Normal growth ($\frac{3}{4}$ lb. per week) ..	6·5
Slow fattening ($1\frac{1}{4}$ lb. per week) ..	9·7
Full fattening ($2\frac{1}{4}$ lb. per week) ..	12·9
Intensive fattening ($2\frac{3}{4}$ lb. per week) ..	15·0

Nutritive Ratio—from 1 : 5 to 1 : 7.

From recent Australian research it is believed that the protein requirement of sheep is considerably greater than that allowed by the English (Cambridge) standards—0·38 lb. protein equivalent per week for maintenance. Wool is a pure form of protein, and, for maintenance and normal wool growth approximately $\frac{3}{4}$ lb. protein equivalent per sheep (100 lb. live-weight) per week is required.

Breeding ewes will require more than an ordinary maintenance ration, because additional nutrients are required for the growth of the unborn lambs. During pregnancy, ewes will require as much food as is necessary for normal growth. Breeding ewes will also require additional protein to stimulate a good milk flow, and green forage is a great benefit to them. There should be at least one part of protein for each five parts of starch equivalent in their rations.

Ewes rearing lambs for the fat-lamb market will require as much food as is supplied by a full fattening ration, while ewes rearing ordinary lambs will require a slow fattening ration. When computing rations for ewes with lambs, the weights of the lambs must be considered and added to the weights of the ewes. Thus a ewe weighing 75 lb., with a lamb weighing 25 lb., will require the same amount of food as a sheep weighing 100 lb. on the full or slow fattening ration. The nutritive ratio of the rations for ewes rearing lambs should not be wider than 1 : 5.

By using Table XII., the maintenance rations for sheep during lean seasons could be supplied by $1\frac{1}{2}$ lb. oaten or lucerne chaff or grass hay, 1 lb. oats or $\frac{3}{4}$ lb. wheat or linseed meal nuts. Nevertheless, it is seldom necessary to feed more than a small portion of the full ration, as pickings are usually available and, to encourage sheep to graze scant pastures to the fullest extent, the necessary supplementary rations should be slightly underestimated. The amount to be fed can be left to the discretion of the owner who should closely observe the condition of his flock.

The use of feeding troughs for sheep is most desirable on sandy country.

Supplementary feed is necessary from the time pigs are three weeks old.

In connexion with the feeding of wheat to sheep, 4 to 5 oz. per sheep per day has been found to be sufficient for dry sheep in paddocks where there is some roughage. During the first week, commence by giving 1½ oz. per head daily for the first two days and then increase the amount by ½ oz. per day until the full amount that it is intended to feed is reached. Any trouble caused by feeding sheep on wheat usually occurs during the first week when some apparently eat too much before they are used to it.

The wheat should be scattered thinly and quickly on the ground so that all the sheep can feed at once. An excellent idea is to tip the wheat into the box of a truck or cart and spread it on the ground through a tube or hose, inserted into the bottom of the box, as the vehicle is driven in circles round the flock until the ration for that particular paddock has been given. If the paddocks become bare, up to ½ lb. of hay should be fed to take the place of natural roughage. Many sheep owners have successfully fed wheat in this way for long periods, and assert that once the sheep have become used to it no amount seems to harm them.

The conservation of surplus grass in the form of hay or silage and the growth of early winter crops of oats or barley for grazing off are economical means of supplementary feeding.

Pigs

Like horses, pigs usually are fed more liberally, since very little experience is required to learn that an underfed pig is not only unsightly and a subject for local comment, but also results in financial loss. In Victoria pigs are usually run in conjunction with dairying to utilize skim milk. Many pigs are reared solely on a skim milk diet. This practice may not be ideal, but it is simple and involves no outlay in purchasing fodders. Skim milk is best when allowed to sour in clean vats before feeding. A pig twelve weeks old can take approximately 2½ gallons skim milk daily.

The value of skim milk as a pig food is explained concisely by Barratt and Mercer in the *Pig Breeders Annual* 1935–36, thus :—

> "In whole milk, separated milk, and possibly in whey there are factors whose presence may prevent disease, produce appetite and aid digestion.
>
> "When fed at the rate of as little as ½ pint per head per day, whole and separated milks have given responses equal to cash values of about 7d. and 5d. per gallon respectively. Additional quantities such as ½ gallon per head per day may give responses in accordance only with their chemical composition, and thus depress the value per gallon to something like 2½d. and 1½d. respectively.
>
> "Excessive whey consumption at more than 2 gallons per head per day appears to have a detrimental influence on belly thickness in a baconer. There is definite evidence that milk and separated milk give rise to lean carcasses, though we have as yet no evidence to enable us to correlate milk feeding with high grading."

It is the protein only in the food that can produce lean flesh, and, for this reason, narrower rations produce the leaner pork and bacon which the present markets demand.

There is slightly less than 1 lb. of dry matter in 1 gallon of skim milk. Some feeders prefer sloppy rations, while in many large piggeries dry feed is fed in hoppers, and water is laid on in troughs. A sloppy ration usually contains at least three parts of water to one of food, and frequently when they are fed in this manner the pigs receive no other water. Pigs have been found to do best when they are fed a

50–50 ration (50 per cent. water and 50 per cent. food), and when they have access to ample fresh drinking water.

The food requirements of pigs are set out in Table XIII.

TABLE XIII.—THE FOOD REQUIREMENTS OF PIGS AND THE MAXIMUM QUANTITY OF GROUND WHEAT TO MIX WITH SKIM MILK TO MAKE A BALANCED RATION FOR PIGS OF DIFFERENT AGES, ETC.

Age in Weeks.	Approximate Live-weights.	Food Allowance per Head Daily.	Approximate Nutritive Ratio.	Maximum Quantity of Ground Wheat to Mix with One Gallon of Skim Milk.
	lb.	lb.		lb.
8 to 12 ..	25 to 50	1½ to 2½	1 : 5	2
12 to 16 ..	50 to 80	2½ to 4½	1 : 5	3
16 to 20 ..	80 to 115	4½ to 5½	1 : 6	4½
20 to 24 ..	115 to 155	5½ to 7	1 : 7	7½
24 to 30 ..	155 to 220	7 to 9	1 : 8	12½
Sows in pig	..	2 to 6	1 : 5	3
Suckling sows	..	8 to 14	1 : 5	3
Boars ..	..	3 to 7	1 : 5	3

The grazing of store and growing pigs, sows, and boars on good pasture is becoming a more general practice, and is to be recommended as an economical method of feeding them. When grazed, porkers and baconers require supplementary grain feeding. Waste fruit and vegetables, household and resturant scraps, tankage, &c., can also be fed profitably to pigs.

Potatoes are the most nutritious root crop used for stock feed. They should be fed in conjunction with grain and a protein supplement. Each pig should receive ½ lb. meat-meal, or ¾ gallon of separated milk and 1½ to 2 lb. of ground grain or pollard daily and as many boiled potatoes as it will eat. As the pig grows, increased quantities of potatoes should be fed to satisfy its appetite.

When concentrates have to be purchased, pollard, barley, wheat, and maize are most favoured.

Wheat can be used to displace pollard, barley, or maize in rations for pigs. Wheat on its own, or in conjunction with pasture, is not as good as barley, for pigs, but together with skim milk or meat-meal it is quite as good. When fed to pigs, it should be more finely ground than when fed to horses or cattle. Young pigs under eight weeks old can be fed very finely-ground wheat, which is easily digested and, in this respect, wheat is superior to barley.

The proportion of skim milk to feed with wheat can be reduced as the pigs grow older, and the *maximum* quantity of grain that it is advisable to feed with skim milk for pigs of different ages, &c., is shown in Table XIII. Barley, maize, and pollard can be used to displace wheat in this table and meat-meal can be used to displace the skim milk, but from three-quarters to one pound of meat-meal will be necessary to displace one gallon of skim milk.

Poultry

For laying hens, the rations that have stood out in all feeding trials are a mash, either wet or dry in the morning, greenstuff at noon, and

Feeding trial pens, State Research Farm, Werribee

mixed grain in the afternoon. The birds require approximately 2 oz. of mash, ½ oz. of greenstuff and 2 oz. of grain each per day. The mash should contain 10 per cent. of meat meal and at least 60 per cent. of pollard or finely ground grain. The remainder of the mash is usually made up with bran to prevent it becoming pasty. More recent feeding trials have shown that high egg production can be obtained with a minimum of labour by feeding whole wheat or mixed whole grain in one hopper and meat meal in another.

Newly hatched chicks are usually started on cracked grain and then put on to a mash containing ground mixed grain and 10 per cent. of dried buttermilk or 5 per cent. of dried buttermilk and 5 per cent. of meat meal with greenstuff and cracked grain, until they are 3 to 4 months old, when they are fed similar rations to the layers.

Shell grit always should be available for poultry to make up the deficiency of lime in the concentrates fed to them and for shell formation. It is desirable also that growing birds have a run or some free range. Good quality greenstuff should be fed daily.

Feed Taints

At times certain fodders, principally green fodders and silage, are known to cause taints and otherwise affect animal products. Milk is most susceptible to taints. At certain stages of their growth, many green fodders, such as lucerne clovers, rape, and cabbages, as well as silage and wet brewers' grains, taint milk. Many weeds, onions, and numerous aromatic plants also cause similar troubles.

Taints in mutton and lamb are noticed when sheep and lambs are slaughtered directly after grazing on lucerne, rape, or pastures highly infected with weeds such as hoary cress, mustard, &c.

Pork becomes tainted when the pigs, before slaughter, have been fed such materials as fish tankage. Maize and fish products are also held responsible for producing oily bacon, but this defect can usually be overcome by correctly balancing the ration and adding variety to it. Linseed meal and cod liver oil are two products which produce a soft, oily fat in pigs.

Feed taints in milk are usually at their worst for the first six hours after the consumption of the responsible foods. After twelve hours the taints are slightly evident, but after eighteen hours they appear to have completely gone. Taints in meat can be overcome by changing the diet to foods that will not taint, approximately one week before the animals are killed.

Analyses and Nutritive Value of Fodders

Mr. W. R. Jewell, M.Sc., Agricultural Research Chemist of the Department, has made available the average composition of the more common fodders. These analyses, which represent the averages of many Victorian samples, are tabulated in the concluding pages of this article. Analyses of different samples may vary considerably from the figures in the following table, depending upon the quality, stage of maturity, &c.

The digestible nutrients have been calculated from the chemical analyses in the same proportions as shown by Prof. Wood and Dr. Woodman, in "Rations for Livestock," Bulletin No. 48, published by the British Ministry for Agriculture and Fisheries.

	Average Composition.							Digestible Nutrients (Calculated from Chemical Analysis).				Food Values (Calculated from Digestible Nutrients).			
						Crude Carbohydrate.				Carbohydrate.					
	Moisture.	Dry Matter.	Ash.	Crude Protein	Crude Fat.	Fibre.	Soluble.	Protein.	Fat.	Fibre.	Soluble.	Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
	%	%	%	%	%	%	%	%	%	%	%	Per 100 lb.	Per 100 lb.	Per 100 lb.	1 :
Green Fodders.															
Pasturage (mixed grasses and clovers, succulent and closely grazed)	80·0	20·0	2·3	5·6	1·1	3·2	7·8	4·9	0·7	2·6	6·8	17	14	4·5	2·3
Pasturage (mixed grasses and clovers, flowering)	75·0	25·0	2·1	3·7	0·9	7·1	11·2	2·6	0·5	4·6	8·9	17	14	2·2	5·6
Cocksfoot grass	No figures available.														
Perennial rye grass	75·2	24·8	2·6	2·9	0·7	7·1	11·5	1·8	0·3	4·0	7·4	14	11	1·6	6·7
Prairie grass	76·8	23·2	2·5	4·1	0·8	6·7	8·9	2·7	0·5	4·5	7·1	15	13	2·3	4·8
Alsike clover	85·0	15·0	1·5	3·3	0·6	4·5	5·1	2·1	0·4	2·2	3·6	9	6	1·8	3·2
Red clover	81·0	19·0	1·6	3·4	0·7	5·2	8·1	2·5	0·5	3·0	6·3	13	10	2·1	4·0
Strawberry clover	No figures available.														
Subterranean clover	81·5	18·5	2·1	4·4	0·8	4·3	6·9	2·8	0·5	2·6	4·7	11	9	2·4	3·0
White Dutch clover	76·0	24·0	2·3	4·5	0·8	6·8	9·6	3·2	0·4	2·9	6·3	13	9	2·5	3·2
Lucerne, in flower	82·0	18·0	2·0	2·9	0·5	3·2	9·4	2·1	0·4	1·9	6·1	11	9	2·0	4·3
Oats, feeding-off stage	76·8	23·2	1·8	1·9	0·6	8·5	10·4	1·4	0·4	4·9	6·5	14	10	1·1	8·9
Oats, in flower	81·0	19·0	2·2	2·4	0·5	4·0	9·9	1·9	0·3	2·2	7·2	12	9	1·8	5·3
Barley, feeding-off stage	79·0	21·0	1·8	2·7	0·6	7·9	8·0	1·8	0·4	5·1	5·8	14	11	1·6	6·6
Barley, in flower	82·0	18·0	2·0	2·9	0·5	3·2	9·4	2·1	0·4	1·9	6·1	11	9	2·0	4·3
Wheat, feeding-off stage	78·0	22·0	2·0	1·8	0·6	8·0	9·6	1·4	0·4	5·0	6·2	14	11	1·1	8·0
Wheat, in flower	82·0	18·0	1·2	1·7	0·5	5·6	9·0	1·0	0·3	3·1	5·8	10	8	0·8	9·7
Maize	80·0	20·0	1·4	2·1	0·6	6·2	9·7	1·2	0·2	3·3	5·8	11	8	1·0	7·8
Sorghum	83·8	16·2	3·4	2·0	0·5	1·6	8·7	1·4	0·3	1·1	7·2	10	9	1·2	6·5
Sugar beet tops	77·0	23·0	1·7	3·0	0·9	7·5	10·3	2·1	0·5	4·9	7·0	15	11	1·8	6·2
Rye, in flower	89·0	11·0	1·2	1·5	0·4	2·0	5·9	1·1	0·2	1·4	4·6	8	7	0·9	5·9
Cabbage	86·0	14·0	2·1	3·5	0·7	3·5	4·2	2·5	0·4	1·9	2·9	8	6	2·0	2·3
Rape	80·0	20·0	1·8	3·8	0·4	3·7	10·3	2·6	0·2	1·9	6·8	12	9	2·2	3·5
Peas, feeding-off stage	75·0	25·0	3·0	6·2	0·6	4·6	10·6	4·1	0·3	2·6	6·6	14	11	3·7	2·4
Phalaris tuberosa (succulent) and closely grazed	93·2	6·8	1·2	1·2	0·3	1·1	3·0	0·9	0·2	0·8	2·3	5	4	0·8	3·9
Cape weed	68·0	32·0	2·4	5·2	0·7	8·2	15·7	3·6	0·4	4·9	10·0	21	18	3·4	4·4
Weeping willow leaves and fine stalks															
Root Crops.															
Carrots	83·0	17·0	2·3	1·0	0·2	1·6	11·9	0·7	0·1	1·2	11·4	13	11	0·6	19·7
Mangolds	85·0	15·0	1·4	1·2	0·1	2·3	10·0	0·7	..	0·9	9·2	10	6	0·4	14·3
Potatoes	75·5	24·5	1·1	2·1	0·1	0·9	20·4	1·1	..	0·8	18·4	19	18	0·8	17·5
Sugar Beet	77·0	23·0	2·0	1·3	0·1	1·8	17·8	0·9	..	0·6	16·8	18	13	0·5	19·1
Swede Turnips	86·0	14·0	1·2	1·0	0·1	1·6	10·1	0·8	..	1·1	9·4	10	8	0·5	13·1
Onions	87·7	12·3	0·5	1·1	0·3	0·8	9·6	0·7	0·2	0·5	7·2	9	7	0·4	11·7
Pumpkins	90·5	9·5	0·9	1·2	0·2	1·3	6·0	0·8	0·2	0·8	5·3	8	7	0·5	8·2
Fruits.															
Apples	84·0	16·0	0·3	0·4	0·4	1·0	13·9	0·2	0·3	0·7	11·4	13	12	0·2	40·0
Pears	82·7	17·3	0·4	0·7	0·4	1·4	14·4	0·4	0·3	1·0	11·6	14	12	0·3	33·0
Peaches	86·9	13·1	0·5	0·5	0·1	0·6	11·4	0·3	..	0·4	9·1	10	9	0·2	32·0
Hay.															
Pasture (mostly clover)	16·2	83·8	7·2	12·1	1·6	20·7	42·2	6·8	0·7	11·9	26·4	48	38	5·8	5·9
Mixed grass and clover	14·5	85·5	7·1	6·1	1·8	26·4	44·1	3·4	0·7	15·0	27·5	48	36	2·9	13·0
Clover (red)	16·5	83·5	6·0	13·5	2·9	24·0	37·1	8·5	1·7	11·3	26·0	48	38	7·0	4·9
Subterranean clover (good)	16·9	83·1	8·7	14·4	1·6	18·1	40·3	9·4	0·8	9·1	27·2	48	38	7·9	4·1
Lucerne	10·0	90·0	8·1	14·9	1·8	23·4	41·8	11·1	0·8	9·8	28·4	50	35	8·3	3·6
Oaten	12·6	87·4	5·8	4·9	2·5	23·5	50·7	3·7	1·8	14·2	31·9	55	42	3·5	13·7
Wheaten	13·3	86·7	5·6	5·8	2·0	22·1	51·2	3·2	1·3	7·2	32·4	47	31	3·0	13·4
Wimmera rye-grass	15·0	85·0	7·4	9·0	2·5	24·5	41·6	5·5	1·1	12·8	28·5	50	40	4·7	8·0
Perennial rye-grass	14·5	85·5	7·5	10·5	2·6	22·5	42·4	6·8	1·1	11·7	29·3	51	41	5·8	6·4
Phalaris tuberosa	14·0	86·0	5·8	2·9	1·8	23·8	51·7	1·7	0·8	13·7	32·3	50	40	1·5	28·2
Silage.															
Pasture (mostly clover)	78·5	21·5	2·0	4·6	1·2	6·2	7·5	3·2	0·6	3·6	4·4	11	8	2·4	3·0
Mixed grass and clover	80·0	20·0	2·0	2·3	0·8	6·5	8·4	1·6	0·4	3·8	4·9	11	8	1·2	6·0
Maize	75·0	25·0	1·8	1·9	0·8	5·8	14·7	0·9	0·4	3·2	7·5	12	9	0·7	13·0
Oat	71·0	29·0	1·8	2·0	1·1	8·7	15·4	1·2	0·5	5·2	8·7	17	12	0·9	12·6
Lucerne	75·0	25·0	2·7	3·7	0·8	6·9	10·9	2·5	0·4	2·9	7·6	16	11	2·0	4·6
Wheat	70·0	30·0	3·0	2·4	0·9	9·7	14·0	1·4	0·5	6·3	8·9	17	12	1·0	11·7
Barley	No figures available.														
Straw.															
Barey	10·0	90·0	5·9	3·5	1·5	36·7	42·4	0·8	0·5	19·8	22·5	44	23	0·7	54·4
Oats	11·0	89·0	6·1	2·2	1·6	31·0	48·1	0·7	0·5	17·6	22·1	41	21	0·6	58·4
Wheat	11·0	89·0	6·3	4·1	1·4	29·1	48·1	0·2	0·4	14·6	17·8	34	13	0·1	66·8

—	Average Composition.							Digestible Nutrients (Calculated from Chemical Analysis).				Food Values (Calculated from Digestible Nutrients).			
	Moisture.	Dry Matter.	Ash.	Crude Protein.	Crude Fat.	Crude Carbohydrate.		Protein.	Fat.	Carbohydrate.		Gross Digestible Energy.	Starch Equivalent.	Protein Equivalent.	Nutritive Ratio.
						Fibre.	Soluble.			Fibre.	Soluble.				
	%	%	%	%	%	%	%	%	%	%	%	Per 100 lb.	Per 100 lb.	Per 100 lb.	1 :
Hulls or Husks.															
Flax-boll chaff	12·0	88·0	5·0	8·5	2·5	30·0	42·0	6·9	2·3	7·8	18·5	40	22	6·5	4·6
Barley hulls	12·0	88·0	5·5	3·5	1·0	33·0	46·0	0·8	0·3	17·8	24·5	44	23	0·7	53·8
Oat hulls	12·0	88·0	6·2	1·8	0·8	32·5	46·7	0·5	0·1	18·7	21·6	41	21	0·4	81·2
Pea hulls	12·0	88·0	7·5	5·7	1·2	31·0	42·6	1·2	0·6	15·5	21·3	40	21	1·0	31·9
Rice hulls	10·0	90·0	9·5	3·8	1·4	38·0	37·3	0·4	0·9	0·4	13·3	16	3	0·3	41·0
Seeds and Grains.															
Barley	13·0	87·0	2·6	9·6	1·5	2·7	70·6	7·2	1·2	1·5	65·1	76	71	6·8	9·7
Maize	12·5	87·5	1·3	9·5	4·0	2·3	70·4	7·6	2·5	0·8	64·5	79	77	7·4	9·4
Millet (Japanese) ..	11·5	88·5	3·7	12·6	4·8	8·6	60·8	9·5	3·8	2·9	45·6	69	62	9·1	6·1
Millet (Foxtail) ..	12·8	87·2	3·9	10·9	2·9	14·3	55·2	..	..	..	..	..	..	..	..
Oats	11·0	89·0	3·5	10·3	5·0	10·2	60·0	8·0	4·9	2·6	46·2	69	62	7·6	7·6
Rice (polished)	12·1	87·9	1·0	6·7	0·5	1·2	78·5	5·8	0·2	0·6	76·2	84	82	5·7	13·3
Sorghum	12·8	87·2	1·9	8,9	3·6	2·0	70·8	6·7	2·9	1·0	60·2	74	68	6·4	10·2
Wheat	11·5	88·5	1·7	10·0	2·0	2·1	72·7	8·5	1·3	1·0	66·6	79	72	8·0	8·3
Peas	14·0	86·0	2·8	22·5	1·6	5·4	53·7	19·4	1·0	2·5	49·9	77	69	18·2	2·8
Vetches	13·3	86·7	3·2	26·0	1·7	6·0	49·8	22·9	1·5	3·9	45·8	80	70	21·5	2·3
Linseed	8·0	92·0	3·8	18·5	36·0	11·5	22·2	14·8	34·3	3·7	17·8	121	117	14·3	7·3
Rape	7·3	92·7	4·2	19·6	45·0	5·9	18·0	15·9	42·8	1·5	14·4	132	130	14·8	6·4
Sunflower	7·5	92·5	3·4	14·2	32·3	28·1	14·5	12·8	30·7	9·4	10·3	105	104	11·9	7·1
Milk and Animal By-products.															
Blood meal	9·5	90·5	3·0	76·0	1·5	2·0	8·0	69·2	1·5	1·0	5·7	92	66	65·0	..
Lean Meat, livers ..	75·0	25·0	1·5	20·0	3·5	..	..	18·8	3·4	..	..	32	30	18·8	..
Fish meal (English) ..	13·0	87·0	21·0	61·0	3·5	..	1·5	55·0	3·3	..	1·2	74	59	53·0	..
Liver meal	10·0	90·0	5·0	65·0	18·0	..	2·0	60·0	17·0	..	1·2	115	94	58·0	..
Meat meal (60 per cent. crude protein) ..	9·5	90·5	11·5	60·0	11·5	2·0	5·5	56·0	10·9	1·0	3·0	102	84	54·5	..
Meat and bone meal (55 per cent crude protein) ..	9·5	90·5	11·5	55·0	8·0	2·0	14·0	46·7	7·6	1·0	7·8	74	67	43·0	..
Meat and bone meal (45 per cent. crude protein) ..	9·5	90·5	21·5	45·0	10·0	2·0	12·0	34·8	9·5	1·0	6·7	67	60	30·0	..
Milk, whole	87·2	12·8	0·7	3·6	3·7	..	4·8	3·4	3·7	..	4·8	18	17	3·4	4·1
Buttermilk, fresh ..	90·8	9·2	0·7	3·6	0·8	..	4·1	3·4	0·8	..	4·1	11	9	3·4	1·8
Buttermilk, dried ..	9·7	90·3	8·6	32·1	5·7	..	43·9	30·4	5·7	..	43·9	94	85	30·4	2·0
Separated milk, fresh ..	90·4	9·6	0·8	3·8	0·1	..	4·9	3·6	0·1	..	4·9	9	8	3·6	1·4
Separated milk, dried ..	10·0	90·0	7·0	30·0	0·9	..	52·1	28·5	0·9	..	52·1	87	79	28·5	2·0
Cheese whey, whole ..	93·4	6·6	0·7	0·7	0·2	..	5·0	0·6	0·2	..	5·0	6	6	0·6	9·2
Cheese whey, dried ..	2·5	97·5	8·5	12·0	0·7	..	76·3	11·4	0·7	..	76·3	92	90	11·4	6·8
Oil Meals and Cakes.															
Coconut meal	11·0	89·0	5·5	20·0	6·5	8·0	49·0	15·8	6·3	5·1	40·6	80	76	15·6	3·8
Cotton seed meal ..	9·7	90·3	5·5	39·0	8·0	11·5	26·3	33·7	7·6	2·9	17·5	79	66	33·0	1·1
Linseed meal	11·0	89·0	6·5	30·0	8·5	10·5	33·5	25·8	7·8	5·2	26·8	82	72	25·1	2·0
Linseed meal, extracted	11·0	89·0	6·2	31·5	1·5	9·5	40·3	27·2	1·4	4·9	32·2	76	63	26·0	1·5
Peanut meal	7·2	92·8	4·6	48·0	5·0	5·0	30·2	43·4	4·7	0·5	25·6	92	78	42·6	0·9
Rate seed meal.. ..	8·5	91·5	8·2	35·0	4·0	12·0	32·3	29·2	3·2	1·2	25·9	68	54	26·9	1·2
Cereal and Other By-products.															
Barley bran	11·5	88·5	4·5	11·6	5·0	10·0	56·9	9·8	4·3	2·0	49·6	71	64	9·5	6·2
Barley, brewers' grains, fresh	75·0	25·0	1·0	5·1	1·5	3·5	13·9	3·7	1·3	1·4	8·6	17	13	3·6	3·6
Barley, brewers' grains, dry	10·0	90·0	2·2	18·5	4·0	15·0	50·3	13·1	3·5	7·2	25·8	60	46	12·6	3·4
Barley malt coombs, dry	9·5	90·5	5·5	24·6	1·8	13·8	44·7	20·0	1·7	12·9	32·6	69	45	16·0	2·5
Malt	7·0	93·0	2·6	13·8	3·1	9·0	64·5	11·0	2·4	4·5	56·4	78	71	9·9	6·1
Bran, wheaten	10·6	89·4	5·0	14·5	3·0	7·5	59·4	10·9	2·1	1·3	42·0	61	44	9·9	4·5
Pollard, wheaten ..	10·5	89·5	3·1	15·0	4·0	5·8	61·8	11·1	3·5	1·4	51·9	75	69	10·6	5·6
Maize Oil Meal (maize germ meal)	6·5	93·5	1·7	21·5	14·0	9·2	47·1	17·2	12·9	5·6	39·5	94	88	17·0	4·5
Maize gluten (polly) feed ..	7·0	93·0	2·9	25·1	5·0	7·8	52·2	21·4	3·6	5·6	45·6	84	78	20·5	2·8
Maize bran, wet ..	79·3	20·7	0·2	3·7	1·0	2·5	13·3	2·4	0·9	0·8	11·7	17	13	2·2	6·1
Oat bran	9·0	91·0	5·5	9·6	5·0	16·5	54·4	4·8	2·8	6·2	37·6	56	48	4·6	10·2
Oat pollard	13·0	87·0	6·5	12·0	8·5	6·5	53·5	9·0	6·8	3·2	39·2	69	62	8·6	6·4
Oat screenings	12·5	87·5	8·5	8·0	5·5	20·0	45·5	6·2	4·6	5·0	35·0	58	50	5·9	8·2
Pea meal	11·5	88·5	3·5	20·5	1·5	6·5	56·5	17·4	1·0	3·0	52·5	78	69	16·3	3·3
Rice meal	9·3	90·7	9·0	11·8	15·0	8·0	46·9	6·9	12·8	2·0	37·0	76	72	6·5	9·9
Rice bran	10·0	90·0	11·0	5·5	7·0	35·5	31·0	3·8	5·8	9·2	22·8	49	39	3·4	11·8
Rice pollard	10·0	90·0	5·5	11·0	15·0	8·0	50·5	6·4	12·8	2·0	39·8	78	74	6·0	11·1
Sugar beet pulp, wet ..	93·0	7·0	0·2	0·6	0·1	1·4	4·7	0·4	..	1·2	4·3	6	6	0·4	13·7
Sugar beet pulp, dry ..	12·0	88·0	2·5	7·6	1·3	17·6	59·0	4·5	..	15·7	53·8	75	64	4·4	15·4
Sugar beet molasses ..	33·7	66·3	7·2	10·0	0·1	..	49·0	3·4	..	..	44·0	45	39	1·2	12·6
Sugar cane molasses ..	24·0	76·0	2·2	10·0	..	..	63·8	3·7	..	..	55·3	56	49	1·2	15·0

THE FLOWER GARDEN

By J. L. PROVAN, B.Agr.Sc., Principal,
School of Horticulture, Burnley Gardens

Bulb Growing

MOST spring flowering bulbs give best results if planted during March. The most popular of these bulbs is the Daffodil, but we must not forget the Hyacinth, the Tulip, and the Snowflake. Corms such as Ranunculus, Anemone, and Freesia might also be planted now.

All of these plants grow best in a good garden loam, which, while retentive of moisture, is also well drained. Daffodils seem to prefer the rather heavier types of soil, except in districts of heavy rainfall, where a more porous type of soil is more desirable.

When planting bulbs some gardeners place sharp sand around the bulbs, and this is a very desirable practice if the sand is easily available and the gardener has the time to do it. It results in very clean bulbs and appears to reduce the losses due to bulbs rotting.

Manuring of bulbs is very important, and two of the best fertilisers to use are either bone meal or bone dust, used at the rate of 3 to 4 oz. per square yard. If the bulbs are planted in an open trench, this quantity of fertiliser can be spread along 15 to 20 feet of the open trench, mixed with the soil and the bulbs planted in it. In sandy soils and those of poorer fertility, 1 oz. of sulphate of potash should be added to the fertiliser recommended above.

When preparing the beds it is always an advantage to dig in some well-rotted organic matter, but on no account should fresh manure be placed near the bulbs. Nitrogenous manures should be used very sparingly, otherwise more luxuriant foliage will result, to the detriment of the flowers.

The distance and depth of planting will vary with the kind of bulb and the size. Well-grown daffodil bulbs should be planted 4 inches deep and about 6 inches apart, and it is preferable to leave these bulbs in the same position for at least three or four years, or until the clumps become so dense that flowering is affected. The lifting of daffodil bulbs each year usually upsets their flowering capacity. Smaller bulbs can be planted about 3 inches deep.

The best effect is obtained by planting the bulbs in groups of a dozen or two dozen in each. The resulting clump of flowers makes a bright spot in the spring garden. Other gardeners like planting bulbs in rows along borders, and although this looks more formal, it can create quite a pleasant effect. In woodland and larger gardens, the best effect is to plant in drifts in light shade, particularly under birch trees.

Well-grown hyacinth bulbs should be planted at least 5 inches deep with about 8 inches between the bulbs. Tulips can be grown successfully in the Melbourne district for one or two seasons as a general rule, but after that gardeners find that the bulbs deteriorate and fresh stocks have to be obtained. Plant them 5 inches deep and 6 inches apart. This plant does much better in porous soils of the cool mountainous districts east of Melbourne.

Snowflake bulbs should be planted about 2 inches deep and 3 inches apart. Ixia corms can be planted 3 inches deep and about 8 inches apart, while ranunculus and anemone corms require to be planted 1 to 2 inches deep and 8 to 9 inches apart.

If the autumn is dry the soil should be kept moist, but do not over-water at this period. Bulbs do not require large quantities of water, and they are able to make their root growth provided the soil is cool and moist, but not too wet.

Bulbs should be planted in full sunshine or under deciduous shrubs and trees, if the shade is not too dense. It must be borne in mind that the plant requires sun to manufacture food for storage in next year's bulb and if insufficient light is obtained the bulbs will not be able to store sufficient food and form the embryo flower for next season. In some cases where there is too much shade, the bulbs may be prevented from flowering until the second year.

THE VEGETABLE GARDEN

Cabbages and Cauliflowers

Plants of *East Ham* and *Savoy* cabbages, and also *Phenomenal Maincrop* cauliflowers may be planted this month. The cabbages should be spaced at least 2 ft. apart in rows 2 ft. 6 inches apart. Cauliflowers will require slightly wider spacing, 2 ft. 6 inches apart in rows 3 ft apart.

When planting these young plants, care should be taken that they are planted at a sufficient depth to make them rigid in the soil. The stems of the basal leaves should be just about soil level.

For cabbages, it is the usual practice to water them at planting time and then to give very little water for the next five or six weeks. In this way a fairly hard type of plant is grown. The opposite treatment is necessary for cauliflowers which should be grown more vigorously from the time of planting out. Every effort should be made to take advantage of the warm weather to develop a large plant in the autumn and early winter, in order to get good heads of cauliflowers in the spring.

Brussel Sprouts

Brussel Sprouts should not be planted out later than the early part of this month. Space the plants 2 ft. apart in rows 2 ft. 6 inches to 3 ft. apart. This crop does best in heavier types of soil and it should be grown under reasonably hard conditions. It is necessary, if good results are to be obtained, to purchase good strains of reliable seedlings. *Fillbasket, Covent Garden* and *Yates' Champion* are well known varieties.

All cabbages, cauliflowers and Brussel sprouts will require to be protected from the cabbage moth and the cabbage white butterfly. Regular dustings or sprayings with arsenate of lead every 12 to 14 days will be necessary to check these insects.

Silver Beet

Plants of silver beet, to provide early winter greens, should be set out this month, spacing the plants 12 inches apart in rows 18 to 24 inches apart. *Fordhook Giant* and *Dark Green Broad Ribbed* varieties are most suitable, and side dressings of fertiliser can be given to the young seedlings three or four weeks after they are established. Market garden fertiliser used at the rate of 2 to 3 oz. per square yard will be found beneficial.

Onions

Seed of the early types of white onions, such as *Silver Queen, Early Barletta* and *Australian White Queen,* and also *Early Brown Globe* and *Odourless* varieties may be sown this month in seed beds or seed boxes. Cover the seed with about ½ inch of fine sandy soil and keep moist until germination occurs.

Spring Onions

Seed of spring onions may be sown now. Usually *White Lisbon* variety is used for this purpose, the seed being scattered over a seed bed which has been well manured. If this variety of seed is unobtainable, some of the odourless and silver skin types can be used. The important thing about growing spring onions is to grow them quickly so that they do not become too rank in flavour, and by choosing one of the varieties suggested, this objection to "hot" spring onions is also overcome.

Red Beet

Seed of *Early Wonder, Detroit Dark Red, Crimson Globe,* or *Derwent Globe* varieties of red beet (beetroot) can be sown now. This crop

[*Continued on page 130*

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

Harvesting Apples

THE main crop of the Jonathan apple variety will be harvested this month. Apples may be picked at any stage from green to yellow-ripe when they are required for immediate sale. Green Jonathans are quite suitable for jelly-making or cooking, while apples picked later than normal maturity have full flavour and juiciness, but would not be suitable for keeping for long periods.

For cool storage, however, it is important that Jonathans should be picked at the correct stage of maturity. Now that the urgency for picking Jonathans is removed by using sprays for the prevention of drop, even more thought should be given to picking the apples at the correct stage of maturity so that they will have maximum life under cool storage. The correct stage can be recognized by the ground colour of the skin or the colour of the skin where no blush has yet developed. This colour should be just commencing to change from green to yellowish green. Colour charts which show this stage are available free on application to the Horticultural Superintendent, Department of Agriculture, Melbourne, C.2. The development of blush on the Jonathan apple is not necessarily an indication of maturity.

Provided that Jonathans are picked at this stage and held at the correct temperatures in cool store, they retain full flavour until September at least. In order to reduce the storage disorders, soft scald, breakdown, and Jonathan spot to a minimum, it has been found that Jonathans should be held at 36°F. until the end of April, 34°F. until the end of May and thereafter at 32°F. These temperatures are also suitable for the storage of the Delicious variety.

Spraying citrus trees for the control of scale insects.

Codling Moth

Another brood of codling moths is usually active at this time of the year and, because it comes at the height of the picking season, spraying is sometimes neglected. As a result stings and entries damage apples just ready for picking. Instances have been noticed where grubs have hatched out after picking and the fruit has been damaged while in cases.

Spraying to protect fruit yet to be picked should be carried out if codling moths are active this month, even if this means delaying picking for a few days. In order to avoid excessive arsenical residue at this time of the year, a spray of white oil emulsion, strength one gallon in 80 of water, applied immediately after peak activity, would be satisfactory.

Citrus Spraying

Sprays of white oil emulsion, strength one gallon in 40 of water, should be applied to citrus trees this month for the control of scale insects, including red scales and soft brown scales. The black sooty covering which sometimes occurs on citrus leaves is associated with the soft brown scales and white oil emulsion will effectively

control this disease. Bordeaux mixture, strength 3 : 3 : 50, may be combined with the white oil emulsion spray for the control of septoria spotting in northern areas and bacterial pit in southern districts.

Harvesting Walnuts

Prior to harvesting walnuts the soil around the trees should be harrowed so that the surface is quite smooth. This makes the collection of the nuts considerably easier. The time for harvesting can be recognized by the bursting of the hulls and the falling of nuts. The collection of nuts can be hastened by shaking the branches with long poles. It is important to collect the nuts regularly, otherwise they become stained if they are exposed on the ground to wet weather. The hulls should be removed after harvesting and the nuts stacked in trays in a warm situation so that they will dry out. Nuts should not be exposed directly to the sun otherwise the shells will split.

Preparation of Land for Planting Fruit Trees

Where fruitgrowers propose extending or renewing their orchards, it is necessary to make thorough soil preparations beforehand. Where the land has been under native timber, all stumps and roots should be completely removed to reduce the possibility of armillaria, a root fungus present on native trees, being carried over to infect the fruit trees. Deep ploughing is advisable, and on heavy soils, particularly clay loams, the use of the subsoil plough to assist root and moisture penetration can be strongly recommended. Grading land in preparation for irrigation should be carried out at this time of the year.

"THE COUNTRY HOUR"

The Australian Broadcasting Commission recently inaugurated an Australia-wide Agricultural Session, "The Country Hour" which is presented over the National Station 3AR at the following times :—

p.m.		p.m.	
12.15	Opening announcements of rural interest.	12.45	Music.
12.18	Interstate market trends and prices.	12.48	Agricultural talk or actuality broadcast.
12.21	Victorian market reports.	12.56	Music.
12.28	Music.	1.00	"The Lawsons."
12.30	Australian and overseas news.	1.12	Closing announcements and music.
12.42	State news.	1.15	Close.

An Agricultural Review is presented each Friday at 12.48 p.m. This is based on material from the Department of Agriculture, marketing officials, primary producers, and the producers' organizations. Friday's review will consist largely of purely State matters. Other outstanding features are interviews with prominent primary producers on subjects of interest.

THE VEGETABLE GARDEN (*continued from page 128*).

should be sown in drills in the beds where it is to remain. Space the drills 18 inches apart and cover the seed with about ¾ inch of sandy loam. When large enough to handle, thin out the plants to about 3 inches apart. Water well. If the soil is deficient in lime this crop will benefit by an application of 6 to 8 oz. of lime or wood ashes to the square yard.

Green Manuring

Where supplies of stable manure and organic matter are difficult to obtain, the empty beds in the vegetable garden should be sown with peas, barley, tares or mustard, or alternatively, volunteer weeds may be allowed to grow. By sowing or allowing these crops to grow and then digging them into the soil in the spring, the organic matter of your garden soils will be improved. The addition of 2 or 3 oz. of market garden fertiliser per square yard will stimulate the growth of these crops and weeds, and in turn will also enrich your soil. Where sowing a green crop is practised, the seed can be broadcast and lightly forked or raked into the surface soil.

Pickles, Chutneys *and* Sauces

By RUTH BROMFIELD,
Fruit Preserving Expert

PICKLES, relishes and sauces add flavour to any meal. Recent investigations have shown that pickles can be used to a limited extent as a source of minerals and vitamins.

Excellent home-made products can be made from surplus fruits and vegetables provided a few simple rules are followed.

Firstly, only fresh, crisp, unbruised, and not over-ripe fruit or vegetables should be used. A broad pan is a more suitable container than a deep one. Copper or zinc pans should not be used because of the possibility of deleterious salts forming from the metal and acid. Earthen crocks or glass jars are best for brining and storing pickles.

Vinegar, either cider or white is suitable for pickling, but cider vinegar should not be used for white vegetables as it tends to darken them. However, it intensifies the green colour of green vegetables.

When vegetables are to be brined, dairy salt gives better results than kitchen salt.

Granulated or brown sugar, honey or glucose may be used for sweetening pickles.

All pickles, sauces, chutneys, &c., should be poured boiling hot into hot sterilized jars and sealed immediately with corks which have been boiled for 5 minutes and dipped in paraffin or candle grease or covered with wax and then paper. Paper alone does not prevent evaporation and considerable shrinkage of the contents will take place.

Pickles

Mixed Mustard Pickle

1 quart small cucumbers.
1 quart large cucumbers, sliced.
2 quarts small onions, peeled.
3 small heads cauliflower, broken small.
1 quart green tomatoes, sliced.
2 quarts green beans, strung, whole or cut.
1 quart celery cut into 2 inch lengths.
3 red peppers sliced (if possible).

Prepare vegetables, soak overnight in brine (1 cup of salt to each gallon of water). Drain and soak in fresh water for 3 hours. Cover the vegetables with vinegar and water (equal volumes) for 1 hour, then heat to simmering point. Make a dressing as follows :—

1½ cups white or brown sugar.
6 level tablespoons mustard.
6 level tablespoons flour.
2 level teaspoons turmeric.
1 level teaspoon celery salt.
6 cups vinegar.

Mix the dry ingredients and add hot vinegar slowly, stirring to a smooth paste. Return mixture to stove and cook, stirring constantly until it is thick. Drain the vegetables. Add them to the sauce and simmer for 5 minutes. Pack pickles into hot clean jars and seal immediately.

Red Cabbage Pickles

Select a firm head of red cabbage, remove the coarse outside leaves, and cut the cabbage into four sections, rejecting the centre stalk and heavy ribs of the leaves. Shred finely and sprinkle every alternate layer of shredded cabbage liberally with salt and press down with a clean board or plate ; allow to stand for 24 to 36 hours, then thoroughly drain off the brine and place the cabbage loosely in jars, cover with boiling vinegar and seal. The vinegar solution is made as follows :—

1 quart vinegar.
1 oz. whole pepper.
1½ oz. allspice.
½ lb. sugar.

Bring to boil and strain over cabbage.

N.B.—Any air bubbles should be removed by running the blade of a knife around the inside of the jar before sealing.

Pickled Beets

Small beets, cooked and skinned.

¼ cup sugar.
1 tablespoon cloves.
2 cups vinegar.
1 stick cinnamon.
1½ teaspoons salt.
1 teaspoon pepper corns.

Boil sugar, seasoning, vinegar and spices for 5 minutes. Pour over beets which have been packed in hot clean jars. Seal.

Chutneys

Fruit Chutney

3 lb. apples.
3 lb. tomatoes.
3 lb. red plums.
2 lb. white or brown sugar.
1½ teaspoons cloves.
1½ teaspoons whole pepper.
1½ teaspoons allspice.
1½ teaspoons ground ginger.
1 teaspoon mace.
¼ teaspoon cayenne.
¾ lb. stoned raisins.
2 quarts vinegar.

Boil together until all ingredients are well blended and of good colour and consistency. The mixture should not separate out so that there is any free liquid when a little is cooled on a plate. Bottle while hot and seal immediately.

Ripe Tomato Chutney

4 lb. ripe tomatoes.
2 lb. apples.
1 lb. onions.
4 oz. sultanas.
2 level teaspoons salt.
¼ teaspoon cayenne.
½ dozen cloves.
1 small piece whole ginger.
3 small chillies.
1¼ pints vinegar.
1¼ lb. sugar.
1 teaspoon mustard seed.

Peel, core and cut up apples, peel and slice the onions and tomatoes. Tie the cloves, ginger (bruised) and chillies in a spice bag and simmer until of a good consistency (approx. 2 hours).

Tomato Relish

3 lb. ripe tomatoes.
1 lb. onions.
1 lb. sugar.
1 tablespoon curry powder.
1½ teaspoons mustard.
2 tablespoons flour.
1 teaspoon salt.
¼ teaspoon cayenne.

Scald the tomatoes for 2 to 3 minutes in boiling water, then dip in cold water. The skins may then be easily removed. Peel and slice the onions. Put prepared tomatoes and onions in a bowl, sprinkle with the salt and allow to remain overnight. Next morning, barely cover the vegetables with vinegar, add the sugar and boil gently for about 1 hour, then moisten the dry ingredients with a little cold vinegar and stir them into the mixture. Boil all together for another hour or until sufficiently thick.

Cucumber Relish

2 lb. cucumbers.
¼ pint vinegar.
¾ lb. sugar.
1 oz. preserved ginger or ½ oz. green ginger.
4 small chillies or 1 dessertspoon powdered ginger.
½ teaspoon mustard seed.

Peel cucumbers and pass them through the coarse cutter of the mincer; sprinkle the minced cucumber lightly with salt; cover with a plate and allow to remain for 12 hours. Drain thoroughly, rinse quickly in fresh water and drain well.

Cook all ingredients slowly for about 20 minutes, bottle and seal.

Sauces

Tomato Sauce

30 lb. tomatoes.
1¼ cups salt.
5 to 8 cups sugar.
5 to 6 cups white vinegar.
2 teaspoons mace.
2 teaspoons cinnamon.
2 teaspoons cayenne.
3 teaspoons paprika or black or white pepper (black pepper will darken the sauce).
2 teaspoons celery seed.
½ teaspoon grated garlic.
2 teaspoons mustard.
8 onions.

Cook tomatoes until quite soft. Crush the fruit slightly at the beginning of cooking to cause juice to flow back rapidly to retain bright colour. Pass the pulp through a sieve which will retain seeds and skins. Return to fire and add the remainder of the ingredients. The spices, (other than powdered), chopped onion and garlic should be tied in a muslin bag and removed an hour later. Continue boiling the mixture until it is thick (4 to 5 hours approx.).

Standard Herd Records

For Quarter ended 31st December, 1945.

In the following are set out the records of all cows which completed a lactation during the quarter. The number is 280, of which 137 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

N.C.K. denotes no chart kept.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Atkinson, W. K., Swan Hill, Dairy Shorthorn (9).										
Willow Park Comet 31st ..	2181B	273	12½	8,409	3·14	264·3	330	Sr. 4	307, 287 ..	Willow Park Barrington 77th
Willow Park Comet 40th ..	2257C	273	11	5,979	4·44	265·3	270	Jr. 3	288 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Countess 49th	2260C	273	16½	6,176	4·21	260·0	230	Jr. 2	.. ..	Willow Park Royal Barrington
Willow Park Fairy 10th ..	550D	273	26½	8,766	3·76	329·9	350	Mature	269, 325, 352, 392, 404, 425, 338	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Fairy 12th ..	1530C	273	14½	9,427	2·83	267·1	350	Mature	354, 425, 335, 366, 301	Anderson Imperial Cran 6th (Imp.)
Willow Park Melba 53rd ...	2189B	273	16½	6,238	3·54	220·8	230	Jr. 2	.. ..	Willow Park Barrington 98th
Willow Park Moss Rose 21st	2049E	273	21	10,488	3·12	327·1	350	Mature	346, 300, 332	Willow Park Imperial Cran 3rd
Willow Park Red Rose 5th	2161A	273	10	5,597	3·02	169·2	230	Jr. 2	.. ..	Willow Park Royal Barrington 2nd
Willow Park Rosebud 3rd ..	2162A	248	4	4,619	2·93	135·0	270	Jr. 3	.. ..	Willow Park Royal Barrington
Ballarat Orphanage, Ballarat, Jersey (8).										
Orphanage Doris 13th ..	Vol. 32	273	N.C.K.	4,190	4·58	192·0	230	Jr. 2	.. ..	Banyule Gull
Orphanage Handsome 7th	88371	273	N.C.K.	5,110	5·35	273·5	310	Jr. 4	357, 331 ..	Orphanage Centaurus
Orphanage Maid	Vol. 31	273	N.C.K.	6,959	5·14	358·0	230	Jr. 2	.. ..	Clarendon Eyre Oxford Observer
Orphanage Mirthmaker 11th	C.R.	273	N.C.K.	4,916	5·31	261·0	270	Jr. 3	269 ..	Banyule Terraplane
Orphanage Molly 15th ..	Vol. 31	273	N.C.K.	4,370	5·54	242·1	330	Sr. 4	309, 291 ..	Clarendon Eyre Oxford Observer
Orphanage Molly 17th ..	Vol. 31	273	N.C.K.	5,320	5·62	298·8	330	Sr. 4	199, 360 ..	Orphanage Attraction Knight
Orphanage Molly 25th ..	C.R.	273	N.C.K.	4,699	5·06	237·9	230	Jr. 2	.. ..	Banyule Gull
Tobermory Mary ..	79227	273	N.C.K.	4,690	5·71	267·7	350	Mature	326, 280, 273	Samares Golden Prince (Imp.)
Barker, Mrs. E. M., Richardson G. H. and Hornsby, F. C., Vervale, Jersey (4).										
Bank Meadows Lady Bute	85079	273	N.C.K.	4,806	5·90	283·5	330	Sr. 4	.. ..	Wonga Park Erl King
Coral Vale Ladybird ..	Vol. 33	273	N.C.K.	6,426	4·94	317·3	230	Jr. 2	.. ..	Glenone Airman 2nd
Glenone Sunflower Golden..	86484	273	N.C.K.	6,974	5·86	408·6	310	Jr. 4	.. ..	Ardleigh Prince Chut
Wonga Park Diane ..	Vol. 31	273	N.C.K.	5,925	6·37	377·6	290	Sr. 3	.. ..	Wonga Park Wonderful Aim
Bennett, J. W., Yinnar, Jersey (6).										
Ellendale Bluebell 32nd ..	Vol. 31	273	N.C.K.	5,711	5·41	308·8	270	Jr. 3	378 ..	Avalon Prince Madeira
Ellendale Bluebell 36th ..	Vol. 33	273	N.C.K.	4,938	5·45	269·3	230	Jr. 2	.. ..	Carellen Butter King
Ellendale Kirsty 58th ..	Vol. 31	273	N.C.K.	5,859	5·38	315·3	270	Jr. 3	325 ..	Avalon Prince Madeira
Ellendale Romany 26th ..	Vol. 31	273	N.C.K.	4,713	5·18	244·1	250	Sr. 2	293 ..	Avalon Prince Madeira
Ellendale Romany 27th ..	Vol. 33	273	N.C.K.	5,764	5·05	291·3	230	Jr. 2	.. ..	Staghorn Bellboy
Ellendale Vanilla 14th ..	Vol. 31	273	N.C.K.	6,589	5·43	357·5	290	Sr. 3	362 ..	Avalon Prince Madeira

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Bertram, A. E., Drouin, Friesian (6).										
Grandview Daisy	Vol. 15	273	N.C.K.	7,623	3·83	291·9	230	Jr. 2	..	Kelvale Earl Burkeyji
Grandview Illustration	Vol. 15	273	N.C.K.	8,448	3·82	322·5	230	Jr. 2	..	Kelvale Earl Burkeyji
Kelvale Ashlynn Countess	Vol. 15	273	N.C.K.	9,165	4·10	375·4	270	Jr. 3	..	Kelvale Mercedes Ian
Kelvale Princess Ianthe	C.R.	273	N.C.K.	7,077	4·61	326·4	230	Jr. 2	..	Kelvale Prince Bainfield
Warwick Carnation Madcap	C.R.	273	N.C.K.	10,953	3·40	372·2	230	Jr. 2	..	Elmar Iona Patch
Warwick Only Patch	C.R.	273	N.C.K.	9,642	3·26	314·7	310	Jr. 4	306	Elmar Iona Patch
Black Estate, of the late I. S., Noorat, Ayrshire (4).										
Mount Noorat Badalia	34880	273	25	8,072	4·52	364·5	330	Sr. 4	271, 346	Sandhill Kipling (Imp.)
Mount Noorat Georgina 10th	34881	273	15	6,111	4·41	269·4	310	Jr. 4	225, 225	Gowrie Park Bonnie Standard
Mount Noorat Gracious	36613	273	20	8,395	4·07	341·6	270	Jr. 3	294	Sandhill Kipling (Imp.)
Mount Noorat Taffimia	35703	273	23	8,464	4·26	360·3	270	Jr. 3	312	Sandhill Kipling (Imp.)
Broad, Mrs. A. A., Sutton Grange, Jersey (2).										
Grangelea Begonia 2nd	81592	273	22	6,720	5·25	352·7	310	Jr. 4	273, 347	Navua Wonderful Count
Grangelea Royal Bell	86637	273	18	5,850	5·27	308·1	270	Jr. 3	243	Navua Wonderful Count
Broad, E. E., Pyramid, Jersey (2).										
Grangelea Dulcie 3rd	61,941	273	N.C.K.	3,677	6·48	238·2	350	Mature	..	Grangelea Roger 2nd
Grangeville Goldfinch 2nd	Vol. 31	273	N.C.K.	5,058	5·99	303·0	230	Jr. 2	..	Grangelea Robert 3rd
Bruhn, C. H., Mirboo North, Jersey (1).										
Eltekon Princess Inimitable	C.R.	273	N.C.K.	4,776	5·55	265·0	230	Jr. 2	..	Werribee War Volunteer
Butcher, F. T., Swan Hill, Red Poll (3).										
Maryville Ellen	Vol. 13	210 (Sold)	..	3,870	3·85	149·0	230	Jr. 2	..	Temperley Prism
Maryville Flower	9003A	210	N.C.K.	3,420	3·81	130·3	270	Jr. 3	177	Temperley Prism
Maryville Maid	7866A	273	N.C.K.	7,474	4·26	318·3	350	Mature	256, 320, 345	Victoria Generator B
Candler, G. E., Hamilton, Ayrshire (2).										
Jennewar Jacqueline	Vol. 38	273	16½	5,423	4·45	241·1	230	Jr. 2	..	Inverurie Lauchie
Jennewar Loris	Vol. 38	120	4	1,815	4·03	73·1	230	Jr. 2	..	Inverurie Lauchie
Carne, W. J., Pakenham Upper, Jersey (2).										
Glencarne Ace's Starbright	Vol. 33	240 (Sold)	..	4,380	6·44	282·1	250	Sr. 2	..	Wonga Park Ace High
Navuloa Master's Magnet	49805	273	N.C.K.	7,428	4·29	318·5	350	Mature	515, 465, 395, 333, 362	Werribee Grandmaster
Central Methodist Mission, Lilydale, Guernsey (2).										
Melbourne Golden Waterlily	7428	273	12½	5,821	4·49	261·3	350	Mature	243, 302, 384, 264, 362	Nundorah Daredevil
Melbourne Lucille	7445	273	13	5,936	4·20	249·1	350	Mature	192, 263, 380, 287, 365	Yarraview Sequel's Slogan
Chadderton, J. E., Hamilton, Jersey (2).										
Glen Leigh Damson 2nd	86366	273	17	5,696	5·50	313·2	230	Jr. 2	..	Selsey Taxpayer
Glen Leigh Dancer 2nd	86367	273	17½	4,964	5·89	292·3	250	Sr. 2	..	Selsey Taxpayer
Chirnside, R. M., Whittlesea, Jersey (2).										
Mornmoot Fancy Starbright 3rd	63199	273	22	9,095	5·16	469·6	350	Mature	423, 530, 471, 462, 433	Werribee Madeira's Ace
Mornmoot Princess Madeira 26th	82947	273	38	11,319	4·50	508·9	270	Jr. 3	421	Navua Paxie's Volunteer
Clark P. W., and Son, Whittlesea, Jersey (6).										
Coodardy Annette Centurion's	70823	273	21	7,275	4·77	346·9	350	Mature	345, 471, 409, 389	Werribee Centurion
Coodardy Liberty Centurion's	70829	273	26	7,344	4·41	324·0	350	Mature	413, 334, 547, 521, 387	Werribee Centurion
Coodardy Golden Cream	Vol. 32	273	17	5,364	4·89	262·2	230	Jr. 2	..	Navua Paxie's Volunteer
Coodardy Rupert's Annette 4th	85717	273	15	7,128	5·10	363·4	270	Jr. 3	338	Brucevale Lord Rupert
Coodardy Rupert's Glorious	85722	273	22	7,796	5·94	462·8	310	Jr. 4	434	Brucevale Lord Rupert
Coodardy Rupert's Liberty	85723	273	20	6,663	6·28	418·3	310	Jr. 4	316	Brucevale Lord Rupert

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Colenso, L. W. R., Alvie, Jersey (6).										
Normandie Alayke 11th ..	Vol. 33	273	15½	5,135	5·09	261·2	230	Jr. 2	.. ..	Normandie Jolly Boy
Normandie Hawthorn 19th	78134	273	24	6,704	5·47	366·6	350	Mature	204, 389 ..	Normandie Majestic
Normandie Hawthorn 23rd	83187	273	20½	5,867	5·31	311·3	330	Sr. 4	301, 295, 320	Normandie Majestic
Normandie Ilma 3rd ..	45472	273	29	8,039	5·87	471·5	350	Mature	241, 376, 366, 387, 460, 590, 611, 456	Peer of Lewisham
Normandie Ilma 6th ..	68362	273	22½	7,046	5·82	410·2	350	Mature	358, 435, 472, 545, 416	Normandie Majestic
Normandie Ilma 11th ..	78136	273	26	8,694	5·09	442·3	350	Mature	338, 391, 429	Lewisham Playboy
Coulthard, J. J., Whittlesea, Jersey (1).										
Walamba Nancy Grey ..	Vol. 31	273	N.C.K.	3,487	5·42	189·1	270	Jr. 3	233 ..	The Wattles Young Gamboge 3rd
Cowan, G. L. S., Bacchus Marsh, Friesian (5).										
Upper Lappan Beth ..	Vol. 15	273	N.C.K.	11,118	3·32	369·6	350	Mature	368, 382, 444	Upper Lappan Pontiac
Upper Lappan Betty ..	C.R.	273	N.C.K.	6,038	3·33	201·2	230	Jr. 2	.. ..	Lerderberg Top Gallant
Upper Lappan Inverness ..	Vol. 15	273	N.C.K.	9,544	3·63	346·7	270	Jr. 3	.. ..	Upper Lappan Pontiac
Upper Lappan Olga ..	Vol. 15	273	N.C.K.	10,143	3·41	346·2	350	Mature	333 ..	Upper Lappan Pontiac
Upper Lappan Patch ..	Vol. 15	273	N.C.K.	10,169	2·82	287·2	270	Jr. 3	205 ..	Upper Lappan Pontiac
Crawford, Mrs. E., Loy Yang, Jersey (6).										
Balniel D.C. Duchess ..	Vol. 31	273	N.C.K.	4,029	6·95	279·9	250	Sr. 2	.. ..	Balniel Twylish Duke
Balniel Larkspurs Mimi ..	Vol. 31	273	N.C.K.	4,210	5·52	232·2	270	Jr. 3	.. ..	Balniel Master's Volunteer
Balniel Master's Starbright	85049	273	N.C.K.	5,203	5·59	290·6	310	Jr. 4	.. ..	Balniel Master's Volunteer
Balniel Miss Wyandotte ..	85050	273	N.C.K.	5,449	4·88	266·0	310	Jr. 4	.. ..	Werribee War Volunteer
Balniel Morning Star ..	85052	210	N.C.K.	2,980	5·59	166·6	310	Jr. 4	.. ..	Balniel Master's Volunteer
Balniel Royal Idyll ..	Vol. 31	273	N.C.K.	4,809	6·39	307·5	230	Jr. 2	.. ..	Balniel Master's Volunteer
Cuddihy, T. D., Geelong, Jersey (2).										
Pivot Fairy 2nd	C.R.	273	N.C.K.	4,997	5·01	250·6	230	Jr. 2	.. ..	Belgonia Pioneer
Pivot Pearl 2nd ..	C.R.	273	N.C.K.	4,336	4·91	213·3	290	Sr. 3	192, 207 ..	Belgonia Pioneer
Dennis, Mrs. A. A., Frankston, Jersey (1).										
Ballam Louise Lovely ..	Vol. 31	273	20	6,219	5·83	362·5	230	Jr. 2	.. ..	Windrest Gadget's Achievement
Department of Agriculture, Werribee, Friesian (5).										
Anama Auklod Starless ..	Vol. 15	273	9	6,780	3·66	248·4	270	Jr. 3	.. ..	Chellaston Velvet Auklod
Victoria Amaza	Vol. 15	273	30	9,327	3·29	323·7	330	Sr. 4	291, 378 ..	Victoria Conductor
Victoria Havigal ..	C.R.	273	35	10,716	3·74	400·5	230	Jr. 2	.. ..	Terling Hypothesis (Imp.)
Victoria Relief	C.R.	273	30	9,480	3·18	301·7	230	Jr. 2	.. ..	Terling Hypothesis (Imp.)
Victoria Sonnet	Vol. 15	273	29	12,101	3·06	370·7	290	Sr. 3	371 ..	Terling Hypothesis (Imp.)
Department of Agriculture, Werribee, Red Poll (14).										
Victoria Amabel	7003A	273	8	5,583	3·81	212·6	350	Mature	287, 374, 393, 322	Woodburn Peter Pan
Victoria Aurette	C.R.	273	10	3,939	4·62	181·8	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Cassie	9135A	273	20	7,742	4·06	314·6	330	Sr. 4	326, 397 ..	Victoria Petrology
Victoria Content ..	Vol. 13	273	18½	6,355	4·63	294·2	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Corrine	C.R.	273	16	4,520	4·97	224·8	230	Jr. 2	.. ..	Burnwood Masterpiece
Victoria Grate	Vol. 13	273	17½	5,600	4·43	248·3	270	Jr. 3	351 ..	Burnwood Masterpiece
Victoria Marogy	C.R.	273	17½	4,911	4·28	210·1	230	Jr. 2	.. ..	Victoria Petrology
Victoria Mistress B. ..	9153A	273	26	9,123	4·17	380·1	350	Mature	382, 518 ..	Burnwood Masterpiece
Victoria Pepper	9157A	273	29½	9,087	3·98	361·7	350	Mature	389, 437 ..	Burnwood Masterpiece
Victoria Phyllis	9160A	273	24	7,502	3·69	276·8	310	Jr. 4	257, 333 ..	Burnwood Masterpiece
Victoria Pretty	Vol. 13	273	22	7,514	3·89	292·5	230	Jr. 2	.. ..	Woodburn Peter Pan
Victoria Reliance ..	9163A	273	11½	4,864	4·48	218·0	350	Mature	403, 404, 301	Woodburn Peter Pan
Victoria Tambula ..	9169A	273	5	3,525	4·09	144·0	270	Jr. 3	323 ..	Burnwood Masterpiece
Victoria Trophy	C.R.	273	12	4,151	4·96	206·4	230	Jr. 2	.. ..	Burnwood Masterpiece
Desmond, J. J., Rochester, Jersey (1).										
Rochester Cream Lady ..	73713	273	N.C.K.	5,526	5·48	303·0	350	Mature	.. ..	Rochester Gay Lord 2nd
Devon Park Stud Farm (G. S. Daley), Lilydale, Jersey (6).										
Devon Park Aim's Perree ..	Vol. 31	240 (Sold)	..	4,755	5·64	268·2	230	Jr. 2	.. ..	Karrara Eileen's Aim
Devon Park Empire ..	85965	273	22½	5,798	7·38	427·9	270	Jr. 3	364 ..	Karrara Eileen's Aim
Devon Park Golden Eve ..	Vol. 31	273	25	5,683	5·76	327·5	230	Jr. 2	.. ..	Devon Park Golden Standard
Devon Park Victorious Madeira 2nd	Vol. 31	273	15	5,058	6·02	304·5	230	Jr. 2	.. ..	Devon Park Golden Standard
Karrara Standard Empire ..	77086	273	31½	7,300	5·98	436·9	350	Mature	387, 531, 459	Brampton Sporting Standard (Imp.)
Karrara Standard Tecoma	77091	273	16	5,433	5·37	292·0	350	Mature	357, 421, 307	Brampton Sporting Standard (Imp.)

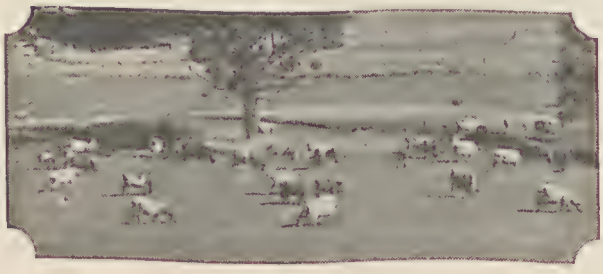
Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.		Sire.
Dookie Agricultural College, Dookie, Ayrshire (3).											
Dookie Bebe	32243	273	N.C.K.	7,507	3·88	291·3	350	Mature	325, 412, 279, 257		Tregorland Indispensible
Dookie Silver	35374	273	N.C.K.	7,200	3·53	254·5	330	Sr. 4	274	..	Gowrie Park Bonnie Sailor
Dookie Singer	Vol. 38	273	N.C.K.	5,730	4·55	260·5	250	Sr. 2	..	..	Dookie Radiant
Dunmore, T. J., Melton, Jersey (1).											
Laura Dell Blondie ..	Vol. 31	273	14½	4,874	5·59	272·3	230	Jr. 2	..	..	Laura Dell Carlad's Aim
Emmett, Mrs. S. and Sons, Stanhope, Jersey (2).											
Shenstone Gem 5th ..	Vol. 32	273	N.C.K.	7,235	4·79	346·3	250	Sr. 2	..	..	The Wattle's Young Gamboge 4th
Shenstone Morn	69085	273	N.C.K.	6,751	4·50	303·8	350	Mature	..	..	Duke of Invermay
Fairchild and Clutterbuck, Tinamba, Jersey (6).											
Vaucluse Daphne 6th ..	89448	273	N.C.K.	6,265	5·59	350·4	310	Jr. 4	337, 371	..	Vaucluse Masterpiece
Vaucluse Madrigal 3rd ..	Vol. 32	273	N.C.K.	5,881	5·63	331·2	230	Jr. 2	..	..	Vaucluse Masterpiece
Vaucluse Tinsel 6th ..	Vol. 32	273	N.C.K.	5,485	5·96	326·7	310	Jr. 4	..	..	Vaucluse Masterpiece
Vaucluse Tinsel 7th ..	Vol. 32	273	N.C.K.	6,472	5·57	360·6	270	Jr. 3	..	..	Vaucluse Masterpiece
Vaucluse Tinsel 8th ..	Vol. 31	273	N.C.K.	3,996	5·73	228·8	250	Sr. 2	265	..	Vaucluse Royal Purple
Vaucluse Trilby	69525	273	N.C.K.	5,411	5·63	304·7	350	Mature	326, 442, 452, 393, 380, 291		Glen Iris Violin
Fixter, A., Boisdale, Guernsey (5).											
Avonview Dulcie 3rd Camilla	9870	273	20	6,999	4·78	334·4	330	Sr. 4	318	..	Vermont Camilla's Sunrise
Avonview Golden Dream ..	9872	273	18½	6,852	5·11	350·4	230	Jr. 2	..	..	Avonview Monogram 12th
Avonview Janice ..	Vol. 15	273	15	5,914	5·77	341·0	230	Jr. 2	..	..	Yarraview Renown
Avonview Royal Lady ..	8278	273	22½	7,829	5·01	392·5	350	Mature	407, 441, 352		Vermont Camilla's Sunrise
Avonview Runica's Winnie	9876	273	24½	7,420	5·12	380·2	310	Jr. 4	307, 388	..	Avonview Monogram 12th
Gay, W. C. R., North Devon, Jersey (2).											
Elm Grove Golden Bluebell	81190	240 (Sold)	N.C.K.	6,075	5·73	348·3	350	Mature	373, 430	..	Elm Grove Gold Star
Elm Grove Silvershine ..	71183	273	N.C.K.	5,169	5·82	301·0	350	Mature	290, 394, 407, 364, 363		Gold Star of Melrose
Gleeson, T. F., Tynong, Jersey (1).											
Glenavon Diana 24th ..	76369	273	N.C.K.	8,039	5·62	451·5	350	Mature	..	..	Glenavon May Star
Handbury, W., Toora, Jersey (2).											
Colyton Lassie Fowler ..	85674	273	N.C.K.	5,380	4·83	260·6	350	Mature	..	..	Glen Iris Dandy's Sultan
Colyton Princess 7th ..	Vol. 31	273	N.C.K.	4,370	5·97	260·7	250	Sr. 2	..	..	Tooravale Axis
Hardie, R. B., Lardner, Jersey (2).											
Glen Urquhart Dandy Banksia	Vol. 31	273	N.C.K.	7,110	5·09	361·9	290	Sr. 3	357	..	Tooravale Dandy's 3rd Son
Glen Urquhart Golden Lass	Vol. 31	273	N.C.K.	6,421	4·69	301·2	310	Jr. 4	314, 333	..	Bellefaire Golden Chevron
Hartley, C. G., Dandenong, Jersey (2).											
Devon Glen Rosalie 2nd ..	Vol. 31	273	N.C.K.	5,187	5·51	285·9	310	Jr. 4	240	..	Belgonia Esperanto
Hildason Peerless Girl 2nd	Vol. 32	180	N.C.K.	1,935	5·53	107·1	230	Jr. 2	..	..	Mornmoot Marmont 2nd
Harvey, T., Boisdale, Jersey (8).											
Jerseyholm Bluebell 39th ..	67186	273	N.C.K.	7,026	5·75	403·7	350	Mature	333, 345, 322, 478, 498		Rowallan Silvanite
Jerseyholm Bluebell 54th..	71967	273	N.C.K.	6,343	4·96	314·6	350	Mature	297, 293, 304		Mornmoot Memnon 2nd
Jerseyholm Empress 58th..	62313	273	N.C.K.	7,002	5·26	368·1	350	Mature	253, 240, 254, 357, 380		Banyule Biplane
Jerseyholm Empress 66th	71970	273	N.C.K.	4,566	5·57	254·5	350	Mature	302, 370, 338		Orphanage Molly's Commander
Jerseyholm Empress 74th ..	76960	273	N.C.K.	9,876	5·09	502·7	350	Mature	410, 436	..	Mornmoot Memnon 2nd
Jerseyholm Empress 85th	81965	273	N.C.K.	6,099	5·46	333·3	270	Jr. 3	349	..	Mornmoot Memnon 2nd
Jerseyholm Lady Marge 27th	86984	273	N.C.K.	8,294	4·53	375·7	270	Jr. 3	278	..	Mornmoot Memnon 2nd
Jerseyholm Lady Marge 28th	86985	273	N.C.K.	6,831	5·16	352·4	270	Jr. 3	347	..	Orphanage Zaffarines Chief
Haywood, Dr. A. R., Hastings, Jersey (2).											
Windrest Gadgets Charm ..	Vol. 31	273	N.C.K.	5,120	5·97	305·5	250	Sr. 2	..	..	Gadget (Imp.)
Windrest Rosebay's Dainty	Vol. 31	273	N.C.K.	9,142	5·72	522·9	310	Jr. 4	400, 491	..	Glen Iris Rosebay's Noble
Hore, E., Leitchville, Jersey (1).											
Milvue Design's Amy 2nd	Vol. 33	273	N.C.K.	6,509	5·21	339·3	250	Sr. 2	..	..	Milvue Mely's 2nd Design

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Hore, M. T., Horfield, Friesian (3).										
Elmar Kitty	Vol. 15	273	N.C.K.	7,269	2·84	206·6	310	Jr. 4	227, 295 ..	Elmar Roseberry
Elmar Loris	C.R.	273	N.C.K.	10,326	2·76	285·1	250	Sr. 2	.. ..	Burnbank Iona Rock
Elmar Style	Vol. 15	273	N.C.K.	8,483	3·23	273·7	250	Sr. 2	221 ..	Burnbank Iona Rock
Johnson, F. G., Horsham, Jersey (2).										
Firebrace Fuchsia ..	Vol. 31	273	N.C.K.	4,420	5·36	237·0	270	Jr. 3	217 ..	Orphanage Arthur
Orphanage Mirthmaker 10th	83294	273	N.C.K.	4,742	5·35	253·9	350	Mature	246, 255, 319	Banyule Terraplane
Keele, H. E., Bamawm, Jersey (1).										
Warion Lisbeth	74431	273	N.C.K.	6,341	4·79	303·5	350	Mature	313, 331, 317	The Wattles Gold Boy
Langlands, F. B., Horsham, Jersey (5).										
Brierwood Flowergirl 6th ..	70482	210 (Sold)	N.C.K.	6,350	4·22	267·8	350	Mature	368, 436, 426	Murona Twylair
Brierwood Flower Lady 4th	Vol. 33	273	N.C.K.	4,795	4·75	228·5	230	Jr. 2	.. ..	Murona Twylair
Brierwood Golden Millie 4th	Vol. 33	180	N.C.K.	2,190	4·75	104·1	230	Jr. 2	.. ..	Werribee Leader
Brierwood Vanity's Lass ..	Vol. 33	273	N.C.K.	5,320	4·78	254·1	250	Sr. 2	.. ..	Werribee Leader
Brierwood Vera	Vol. 33	273	N.C.K.	4,856	5·17	251·1	290	Sr. 3	.. ..	Werribee Leader
Launder, A. P., Glen Waverley, Friesian (2).										
Kelvale Snow Queen ..	C.R.	273	N.C.K.	5,352	4·62	247·4	230	Jr. 2	.. ..	Kelvale Prince Bainfield
Victoria Josephine ..	C.R.	240	N.C.K.	6,429	3·41	219·1	350	Mature	.. ..	Victoria Conductor
Launder, A. P., Glen Waverley, Jersey (5).										
Bangor Starbright Mercedes	Vol. 31	273	N.C.K.	3,222	6·86	221·1	250	Sr. 2	.. ..	Devon Park Starbright's Fireworks
Boneo Gazelle 3rd ..	Vol. 33	273	N.C.K.	3,868	4·91	189·9	250	Sr. 2	.. ..	Banyule Mollison
Cromarty Starbright Queen	Vol. 31	273	N.C.K.	5,130	5·04	258·5	270	Jr. 3	.. ..	Nenagh's Major Starbright
Selma Faith	88929	273	N.C.K.	3,327	5·70	189·6	330	Sr. 4	.. ..	Glen Iris Golden Viol
Nenagh Mona 5th ..	88179	273	N.C.K.	4,673	5·64	263·6	310	Jr. 4	.. ..	Nenagh Starbright's Volunteer
Linke, H. P., Tarrington, Dairy Shorthorn (2).										
Corresdean Butterfly ..	C.C.	273	N.C.K.	6,200	3·92	243·3	290	Sr. 3	.. ..	Drumneil Prince 3rd
Corresdean Fairy May ..	C.C.	273	N.C.K.	5,073	3·91	198·4	290	Sr. 3	.. ..	Drumneil Prince 3rd
Longerenong Agricultural College, Dooen, Ayrshire (1).										
Longerenong Cootamundra Wattle 11th	34854	210 (Sold)	..	3,525	4·54	160·2	330	Sr. 4	208, 256 ..	Dookie Signet
Macauley, C. W., Rochester, Jersey (3).										
Taranah Flora 16th ..	Vol. 33	210	N.C.K.	1,950	6·52	127·2	230	Jr. 2	.. ..	Taranah Conquest
Taranah Floss 9th ..	C.R.	273	N.C.K.	3,128	4·17	130·4	250	Sr. 2	254 ..	Cormal Oxford Lad
Taranah Radiance 5th ..	C.R.	273	N.C.K.	3,633	5·83	211·9	250	Sr. 2	269 ..	Cormal Oxford Lad
McCormack, M., and Sons, Mansfield, Red Poll (1).										
Chandpara Chevron ..	2629AA	273	N.C.K.	8,057	3·57	288·0	350	Mature	292, 291, 261	Chandpara Valentine
McKenzie, Mrs. E. J., and Sons, Woodford, Jersey (5).										
Jubilee Watercress ..	57879	273	11	3,333	4·61	153·7	350	Mature	262 ..	Werribee Stylish Masterpiece
Kameruka Peer's Royal ..	Vol. 32	273	16	4,812	6·00	288·8	230	Jr. 2	.. ..	Brampton Golden Peer
Spring Valley Dillwynia 6th	Vol. 32	273	14	4,815	4·78	230·3	230	Jr. 2	.. ..	Spring Valley Richlight
Spring Valley Maple 2nd ..	Vol. 31	247	4	3,852	5·29	203·8	290	Sr. 3	218 ..	Selsey Gay Prince
Spring Valley Rose Dream 4th	Vol. 32	273	15	4,037	5·11	252·2	250	Sr. 2	.. ..	Selsey Gay Prince
McNabb, G. A. and Son, Irrewillipe East, Jersey (3).										
Maxon D's. Light ..	Vol. 31	273	N.C.K.	6,197	6·34	392·9	330	Sr. 4	.. ..	Maxon Counts Dawn
Maxon V.C's. Favourite ..	Vol. 31	273	N.C.K.	5,703	4·79	273·2	230	Jr. 2	.. ..	Maxon Vice Consul
Xavier Dolichos	Vol. 31	273	N.C.K.	7,169	5·65	405·2	350	Mature	408, 412, 363	Bellefaire Blonde's Bellozanne
Maher, R. H., Tongala, Jersey (7).										
Rosemont Lady Fowler 30th	88810	273	18½	5,238	5·99	313·8	350	Mature	274, 340 ..	Belgonia Perree
Rosemont Primrose 9th ..	78716	273	27½	7,823	4·97	389·1	350	Mature	353, 404, 480	Belgonia Perree
Rosemont Silvermine 25th ..	Vol. 31	273	25	6,510	5·39	350·6	270	Jr. 3	329 ..	Belgonia Perree
Rosemont Primrose 13th ..	Vol. 31	273	18	6,324	5·47	346·1	270	Jr. 3	331 ..	Belgonia Aim High
Rosemont Lady Fowler 46th	Vol. 31	273	14	4,444	5·39	239·6	270	Jr. 3	218 ..	Belgonia Aim High
Rosemont Lady Fowler 47th	Vol. 31	273	17½	4,695	5·55	260·6	270	Jr. 3	246 ..	Belgonia Aim High
Rosemont Lady Fowler 33rd	83727	273	15½	6,311	5·80	366·2	350	Mature	225, 414 ..	Belgonia Perree

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Manly, R. A. A., Somerville. Dairy Shorthorn (1).										
Weeroona Bonny Cress 2nd	C.C.	273	10	3,795	3·93	149·1	230	Jr. 2	.. ..	Weeroona Royal Prince
Meaklim Bros., Mooroopna, Dairy Shorthorn (3).										
Drumneil Ida 2nd ..	2455E	273	9	9,102	3·56	323·6	350	Mature	285, 307, 345	Willow Park Barrington 46th
Drumneil Lily 3rd ..	2458E	273	24½	12,532	3·32	416·0	350	Mature	318, 352, 388	Willow Park Barrington 46th
„ „ 4th ..	2459E	273	15	11,040	3·66	404·0	310	Jr. 4	356, 384 ..	„ „ „
Moore, J., and Co., Yarram, Jersey (1).										
Tooloonook Verbena 11th..	79262	273	N.C.K.	3,819	5·24	200·3	350	Mature	146, 262, 410, 300	Belgonia Lady's Duke
Nicholas, M. A., Sherbrooke, Jersey (2).										
Selsey Princess Wyandotte	64223	273	16	5,637	5·63	317·4	350	Mature	382, 300, 421, 384, 338, 326	Selsey Brampton Boy
Selsey Princess Wyandotte 3rd	Vol. 31	273	14	4,593	6·14	282·2	230	Jr. 2	.. ..	Selsey Samares Master
Nicholson, N. E., Lang Lang, Illawarra Shorthorn (2).										
Devondale Buttercup 11th	35853	273	N.C.K.	5,054	4·43	223·7	350	Mature	297, 348 ..	Devondale Guardsman
Veresdale Dahlia ..	33739	273	N.C.K.	6,105	3·65	222·8	350	Mature	277, 281, 157	Ovensdale Pearls Renown
Noonan, G., Benalla, Jersey (4).										
Noonavale Aim Beauty 3rd	Vol. 33	273	N.C.K.	3,518	5·28	185·7	230	Jr. 2	.. ..	Rosemont High Aim
Noonavale Postman Fowler 2nd	Vol. 32	273	N.C.K.	3,772	5·88	221·7	230	Jr. 2	.. ..	Airlie Postman
Noonavale Silvermine ..	Vol. 31	240	N.C.K.	2,505	6·49	162·6	310	Jr. 4	205 ..	Belgonia Perree
The Wattles Petal 11th ..	84195	273	N.C.K.	4,841	4·39	212·5	310	Jr. 4	403, 294 ..	Belgonia Design's Aim
Parker, L. M., Tallarook, Dairy Shorthorn (6).										
Deep Dale Bonnie 2nd ..	2428E	273	N.C.K.	7,365	3·76	276·7	330	Sr. 4	252, 271 ..	Willow Park Barrington 26th
Deep Dale Gem	1811E	273	N.C.K.	6,489	3·33	216·4	350	Mature	324, 381, 346, 277	Willow Park Banker 2nd
Deep Dale Peach ..	1813E	273	N.C.K.	7,328	4·07	298·5	350	Mature	433, 430, 417	Willow Park Revenue
Deep Dale Sally 2nd ..	2443E	273	N.C.K.	8,505	3·93	333·9	350	Mature	273, 329, 350	Willow Park Barrington 26th
Deep Dale Sylvie 2nd ..	C.C.	273	N.C.K.	6,930	3·45	239·0	250	Sr. 2	.. ..	Willow Park Imperial Cran 34th
Deep Dale Trixie 3rd ..	C.C.	273	N.C.K.	4,856	4·09	198·7	250	Sr. 2	.. ..	Willow Park Imperial Cran 34th
Parkes, E. F., Trafalgar, Jersey (1).										
Irona Designs Benedictine..	Vol. 31	180	4	1,590	6·71	106·7	250	Sr. 2	222 ..	Navua Sociable Designer
Payne, A. E. T., Lilydale, Guernsey (9).										
Yarraview Carol	9761	273	15	9,770	4·81	469·7	350	Mature	339, 258, 447	Honoria's Benefactor (Imp.)
Yarraview Ceres 2nd ..	11955	273	25	8,957	5·03	450·9	310	Jr. 4	362, 425 ..	Honoria's Benefactor (Imp.)
Yarraview Clara's Fashion..	9766	273	22	7,463	4·78	357·0	350	Mature	309, 325, 363	Honoria's Benefactor (Imp.)
Yarraview Faithful ..	11963	273	19½	7,595	4·85	368·0	270	Jr. 3	319 ..	Yarraview Sovereign
Yarraview Heritage ..	11967	273	15½	5,717	5·43	310·4	310	Jr. 4	387 ..	Sunrose of Maple Lodge (Imp.)
Yarraview Rose Gem ..	11976	273	20	5,825	4·93	286·9	250	Sr. 2	150 ..	Yarraview Rex
Yarraview Siren	6643	273	39½	12,063	6·69	806·9	350	Mature	407, 520, 528, 574, 520, 585, 716	Camiela's Majestic of Maple Lodge (Imp.)
Yarraview Symbol ..	11983	273	22½	5,963	6·43	383·2	250	Sr. 2	.. ..	Honorias Benefactor (Imp.)
Yarraview Vivid	11988	273	13	5,936	5·31	315·1	270	Jr. 3	314 ..	Yarraview Earl
Phillips, J. H., Swan Hill, Jersey (1).										
Ryelands Carolina ..	Vol. 32	273	10	6,264	5·31	332·4	230	Jr. 2	.. ..	Pine Ridge Stylish
Powell, T. S., Mansfield, Jersey (2).										
Carellen Dainty Maid 2nd..	80671	210	4	3,142	5·79	181·8	330	Sr. 4	309, 263 ..	Mornmoot Magistrate 2nd
Carellen Golden Duchess ..	70638	273	18	5,681	4·55	258·6	350	Mature	345, 380, 355, 306	Werribee Madeiras Ace
Prince, Mrs. H. A., Swan Hill, Jersey (1).										
Blytheswood Precious ..	90651	273	N.C.K.	5,633	4·97	279·9	230	Jr. 2	.. ..	Austral Park Keeper
Read, Estate of the late J. D. Springhurst, Jersey (1).										
Springhurst Soeurette Romneya	Vol. 31	273	N.C.K.	5,520	5·49	303·1	230	Jr. 2	.. ..	Bellefaire Superlative Pride

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Reid, Estate of Miss B. B., Bundoora, Jersey (2).										
Jubilee Buttercup ..	72002	273	11	2,364	5·35	126·4	350	Mature	248 ..	Jubilee Richlight
Jubilee Lolium	87033	273	6	3,754	4·58	172·0	310	Jr. 4	146, 240 ..	Jubilee Richlight
Ronalds, O., and Son, Tarago, Jersey (1).										
Arlington Clementine ..	70015	273	N.C.K.	9,387	5·88	551·6	350	Mature	428, 431, 423	War Valour (Imp.)
Ross, D. M., Bayswater, Dairy Shorthorn (7).										
Boonong Blush	C.C.	273	25	8,243	3·44	283·3	230	Jr. 2	.. ..	Willow Park Rosy Barrington 3rd
Boonong Duchess 2nd ..	C.C.	273	24	7,442	3·65	271·9	230	Jr. 2	.. ..	Willow Park Royal Barrington
Willow Park Camelia 36th	2040E	273	13	10,114	3·62	366·3	350	Mature	314, 267 ..	Willow Park Imperial Cran 18th
Willow Park Camelia 40th..	2041E	273	21	9,100	3·74	340·2	330	Sr. 4	241 ..	Willow Park Barrington 68th
Willow Park Countess 35th	1512C	240 (Sold)	..	8,865	3·66	324·7	350	Mature	320, 286, 239	Anderson Imperial Cran 6th (Imp.)
Willow Park Countess 47th	2183B	240 (Sold)	..	6,712	3·82	256·3	270	Jr. 3	221 ..	Willow Park Barrington 77th
Willow Park Dainty 16th..	1518C	273	7	8,811	3·76	331·6	350	Mature	271, 355, 264, 259	Anderson Imperial Cran 6th (Imp.)
Simmons Bros., Lilydale, Jersey (3).										
Margolea Lorna	Vol. 31	273	23½	7,571	5·47	414·4	270	Jr. 3	.. ..	Mount Violet Rochettes Volunteer
Margolea Tridents Anna ..	C.R.	273	17	4,370	5·12	223·7	230	Jr. 2	.. ..	Werribee Trident
Willis Vale Eminent's Milkmaid	Vol. 33	273	28½	7,934	4·79	380·0	230	Jr. 2	.. ..	Willis Vale Hope's Eminent
Smith, R. W. and Son, Koo-wee-rup, Friesian (3).										
Kelvale Segis Muller ..	5734	273	18	6,800	3·93	267·3	350	Mature	.. ..	Kelvale Segis Ian
Wattle Bank Flora ..	Vol. 15	273	11	4,615	3·30	152·5	290	Sr. 3	325 ..	Wattle Bank Oakview Segis
Wattle Bank Priscilla ..	Vol. 15	273	20	6,003	3·41	204·5	310	Jr. 4	314, 327 ..	Wattle Bank Oakwood De Kol
Stephens, Dr. F. G., Vermont, Guernsey (5).										
Roads End Antoinette ..	3409	273	22	8,148	4·43	360·8	350	Mature	398, 340, 303, 198, 295, 313, 381	Glenburnie Ideal
Vermont Eve	9559	273	15	5,142	5·75	295·6	350	Mature	348 ..	Melbourne Golden Lodestar
Vermont Venus	11749	273	14	6,162	4·52	278·3	290	Sr. 3	278 ..	Vermont Melfort
Yarraview Cynthia ..	11957	273	12	5,024	5·15	258·7	290	Sr. 3	373, 280 ..	Sunrose of Maple Lodge (Imp.)
Yarraview Vampire ..	11986	273	9	4,752	4·76	226·4	310	Jr. 4	220, 94 ..	Yarraview Earl
Syme, D., Woori Yallock, Guernsey (1).										
Meadow Vale Marcia ..	7394	273	N.C.K.	6,872	5·01	344·1	350	Mature	508 ..	Camellia's Majestic of Maple Lodge
Tait, W. G., Dreeite, Jersey (3).										
Stonybank Gaiety Girl 15th	89030	273	18	3,948	7·09	280·0	250	Sr. 2	280 ..	Mornmoot War Ward
Stonybank Snowdrop 7th ..	83979	273	20	5,052	4·63	233·8	290	Sr. 3	329, 277 ..	Mornmoot War Ward
Stonybank Snowdrop 9th ..	89031	273	19	4,762	5·74	273·2	250	Sr. 2	314 ..	Mornmoot War Ward
Tandberg, G., and Son, Whitelaw, Illawarra Shorthorn (2).										
Bodalla Enid	Vol. 10	273	..	6,095	3·77	230·0	350	Mature	387 ..	Swanlea Lancelot
Ovensdale Biddy 7th ..	Vol. 10	120	..	1,305	4·08	53·2	250	Sr. 2	.. ..	Parkview Signalman
Trevaskis, F. T., Tongala, Jersey (1).										
Ballara Moira 8th ..	85020	273	N.C.K.	5,335	5·37	286·6	290	Sr. 3	.. ..	Werribee Madeira's Ace
Trewin, J. V., Nathalia, Jersey (2).										
Weir View Northern Princess 3rd	74483	273	N.C.K.	7,537	5·47	412·0	350	Mature	345 ..	Carellen Northern Duke
Weir View Princess ..	89592	273	N.C.K.	5,912	5·21	308·1	250	Sr. 2	.. ..	Ballara Ideal's Ace
Turner, A. J., Yannathan, Jersey (3).										
Fontenay Narda	Vol. 31	273	N.C.K.	3,020	5·67	171·3	230	Jr. 2	.. ..	Selsey Designer
Fontenay Princess ..	Vol. 31	273	N.C.K.	3,990	5·36	213·9	250	Sr. 2	.. ..	Selsey Designer
King's Vale Linda 110th ..	87216	273	N.C.K.	3,410	5·79	197·3	270	Jr. 3	.. ..	King's Vale Bradman
Tyssen, C. J., Warragul, Jersey (1).										
Somerville Primrose 2nd ..	73913	273	18	5,534	6·02	332·9	350	Mature	325, 358, 362, 373	Brampton Pioneer Chut (Imp.)
Unthank, Miss F., Hastings, Jersey (1).										
The Hollies Pearl 2nd ..	Vol. 32	273	N.C.K.	3,965	5·24	207·8	230	Jr. 2	.. ..	Windrest Charming Gadget 2nd

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Vaughan Bros., Girgarre, Jersey (3).										
Lynroy Aster	C.R.	210	N.C.K.	4,005	5·34	213·9	310	Jr. 4	313, 276 ..	Carellen Madeira's Pride
Lynroy Fancy 5th ..	87573	273	N.C.K.	6,261	6·39	400·1	350	Mature	347, 394, 411	Werribee Laverock
Lynroy Valetta	87579	273	N.C.K.	6,317	5·91	373·1	310	Jr. 4	261 ..	Carellen Madeira's Pride
Wade, G. F., Stratford, Jersey (4).										
Balniel Starbright ..	56234	273	N.C.K.	6,942	5·48	380·4	350	Mature	253, 280, 310, 339	Werribee War Volunteer
Inverbroom Empress 7th ..	67090	273	N.C.K.	7,728	6·49	501·7	350	Mature	501, 385, 432, 424, 99	Banyule Airport
Inverbroom Empress Antoinette	71869	273	N.C.K.	8,195	5·46	447·5	350	Mature	328, 377, 501	Inverbroom Marie's Chief
Inverbroom Ruby's Marie..	67091	273	N.C.K.	8,588	4·81	412·8	350	Mature	508, 442, 483, 473, 538	Inverbroom Marie's Majest
Walker, C. S., Swan Hill, Jersey (1).										
Grangelea Pretty Primrose 6th	86629	273	24½	9,104	4·66	424·2	290	Sr. 3	361 ..	Navua Wonderful Count
Waterhouse, H. W., and Son, Pakenham, Jersey (7).										
Navuloa Laburnum's Lady	83100	273	30	10,360	5·24	542·4	310	Jr. 4	250, 367 ..	Staghorn Laburnum's Masterpiece
Navuloa Master's Stralia ..	49808	273	20	8,802	4·68	411·8	350	Mature	454, 450, 461, 428, 459	Werribee Grandmaster
Navuloa Royal Lass ..	88161	273	21	7,683	5·47	420·1	290	Sr. 3	428 ..	Ovalau Magnet's King
Ovalua Arctic	Vol. 31	273	21	7,012	5·05	354	370	Jr. 3	358 ..	Ovalua Magnet's King
Ovalua Caramel	Vol. 31	273	17	6,056	5·33	322·5	230	Jr. 2	.. ..	Werribee Planet
Ovalua Magnetic ..	78274	273	16	8,976	5·05	453·7	350	Mature	356, 353, 440	Staghorn Laburnum's Masterpiece
Ovalua Wyandotte Cream..	78279	273	18	7,314	5·88	429·9	350	Mature	299, 422, 396, 445	Brucevale Wyandotte's King
L. Williams, Bamawm Extension, Jersey (1).										
Bamawm Lassie Belle 2nd..	Vol. 31	273	N.C.K.	8,501	5·63	478·5	230	Jr. 2	.. ..	Mornmoot War Hero
A. Wilson, Port Fairy North, Ayrshire (9).										
Lough View Balm ..	33866	273	7	4,461	5·15	230·0	350	Mature	266, 194, 209	Carracoorte Bobby
Lough View Balm 3rd ..	35680	273	11	3,948	4·78	188·8	310	Jr. 4	207, 230 ..	Lough View Bell Lad
Lough View Bellona ..	32778	273	7	6,053	3·80	229·9	350	Mature	243, 304, 211	Carracoorte Bobby
Lough View Blanch 4th ..	36579	273	8	3,896	4·43	172·5	290	Sr. 3	159 ..	Lough View Bell Lad
Lough View Brownie ..	32778	273	6	4,503	4·47	201·1	350	Mature	196, 289, 227, 256	Carracoorte Bobby
Lough View Brownie 5th ..	35682	273	20	6,483	4·18	270·9	310	Jr. 4	251, 265 ..	Lough View Victor
Lough View Fairy ..	35683	210	4	3,630	3·88	140·9	310	Jr. 4	173, 233 ..	Lough View Bell Lad
Lough View Music 2nd ..	35685	273	14	5,414	4·19	226·7	350	Mature	259, 262, 267	Carracoorte Bobby
Lough View Petunia 2nd ..	33860	273	8	5,693	3·89	221·3	350	Mature	266, 310, 292	Carracoorte Bobby
Woodyer, P. A., Mornington, Jersey (1).										
Selma Petal	C.R.	273	12	3,864	5·60	216·4	290	Sr. 3	263 ..	Glen Iris Golden Viol



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Issued by direction of the Hon. W. G. McKenzie, M.L.A., Minister of Agriculture.

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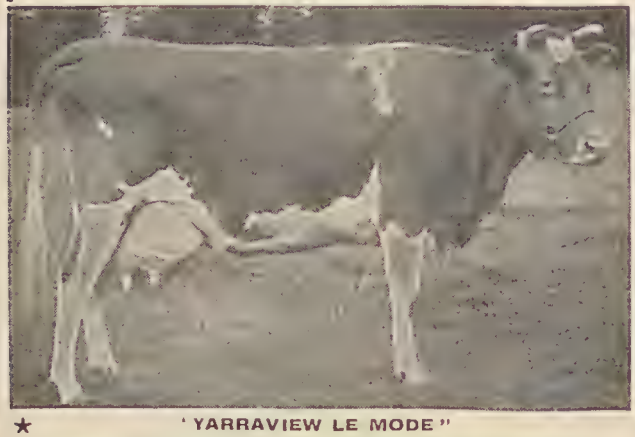

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FUNDAMENTALS OF SOIL CONSERVATION

By R. G. THOMAS, M.Agr.Sc., *Technical Officer, Soil Conservation Board*

The picture at the head of this article illustrates portion of the Eildon Reservoir on the Goulburn River. The weir is part of a system serving one and a quarter million acres of irrigated land. Proper use of catchment areas will conserve soil and timber, and protect the water storages so vital to the State.

THE first fundamental in an approach to the problem of soil conservation is a proper attitude on the part of all those concerned to the soil itself. The emphasis is on "all those concerned". The people in general are concerned, and vitally. Their attitude to the problem should be such that they will not allow the national heritage of soil to be lost through exploitation.

All financial institutions interested in land investment are even more intimately concerned, and should be prepared to recognize their responsibilities and do their share towards preventing loss of soil, at the same time conserving their own asset. There is a moral, if not a legal, obligation on these institutions to undertake their share of responsibility.

Then there is the attitude of the farmer himself to his land. The landholder must come to regard the soil itself as *the* asset of the farm; to realize that without it there would be no farm. In his own interests, and in the interests of the nation he should do everything within his power to ensure that this asset, this soil, is conserved and if possible, improved. Such an attitude is essential as a basis for all thinking applied to the problem of saving the soil. Our use of the Australian soil has too often been exploitative in character, and we have come to regard it as something permanent and indestructible. We have, for too long, thought of the soil as capable of continuing to produce indefinitely the goods we need irrespective of the treatment it receives. Unfortunately we have to-day ample evidence that soil is not indestructible; that it is, in fact, very readily destructible.

The general attitude to the soil is clearly shown by the fact that, while mortgage or leasehold agreements usually include carefully drawn up provisions for the maintenance of buildings, fences, and other improvements, it is the exception to find in such documents specific provision for maintenance of the farm's major asset, the soil itself.

The soil may be likened to the productive plant of a manufacturer. It is a manufacturing plant for the production of all those forms of vegetable and animal produce on which man is dependent for food, clothing, &c. There is this

very important difference, however. The manufacturer makes provision for the depreciation of his plant, and when it has outlived its usefulness he is in a position to replace that plant with other, possibly better plant. The user of the soil cannot do this. Nature has taken thousands of years to produce the soil and man cannot repeat the process at will. He is therefore obliged to *maintain* his manufacturing plant, or in other words to conserve his soil.

Causes of Soil Erosion

The causes of soil erosion are many and varied, direct and indirect. There are, for instance, the direct effects of ploughing land up and down hill, of fire, and of overgrazing, and the indirect effect of various economic factors.

To fasten the blame for erosion to any one cause is dangerous. Particularly is this so if we persuade ourselves that erosion is due to variation in seasons. To blame the drought for wind erosion and the particularly wet season for the occurrence of gullies and "scalded" patches is wrong. These things are part and parcel of our inheritance; the season that we regard as abnormal is in fact normal to our climate, which is one of great variability. That climate cannot be changed; therefore the land must be so used that it can withstand, as it did under natural conditions, the stresses due to the particular climate to which it is exposed.

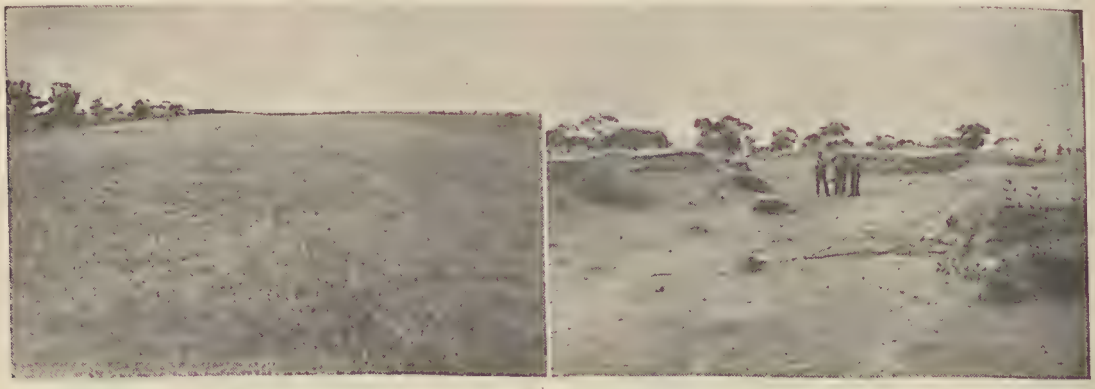
There are people who maintain that erosion has been caused by the clearing of timber, and that the one remedy is to plant trees. Undoubtedly, had our formerly forested country so remained and been kept free of fire, the soil would have been safe. But much of it can be held safely and more productively under agricultural and pastoral use if treated with care. We do not necessarily assist erosion control by planting or retaining trees; the few pine trees sometimes left on a mallee sand ridge can be a positive menace. But trees do have a definite place in any national scheme of soil conservation, and on individual farms also.

There are others who maintain that high land values are the cause of soil erosion, but this, at best, is a partial truth. Over capitalization has, in some cases, forced men to attempt over-production in an endeavour to meet their commitments, and this has brought erosion in its train. On the other hand, much land held by farmers who are not financially embarrassed, is known to be suffering severely from erosion.

Correct Land Utilization

Soil conservation is based on proper use of the land. There are two principal aspects of this, namely:—

(1) Some areas of land are so favoured in regard to soil types, climate, and topography, that on them, agriculture of almost any sort may be practised with safety, provided only that soil fertility is maintained by good land husbandry. On other areas such agriculture may be practised but only with careful regard to erosion hazards due to differences in the soil types, climate, and topography. Other areas again are suitable for grazing, but not for agriculture, and still other areas cannot with safety be cleared and subjected to agricultural or grazing uses at all. Of these latter areas, some may be fit for commercial timber growing, and safely held under that use provided that proper methods are used and the country is not ravaged by fire. There



The same ridge on adjoining properties. Left: Careful use has protected this land. Right: Careless use has allowed serious "blowing" to occur on this portion of the ridge.

By checking run-off, contour furrows prevent erosion and aid pasture growth. Note water in furrows.

are other areas of little value for the commercial production of timber, but which may be of value for purposes of water supply.

(2) On land used for purposes to which it is suited, proper practices can ensure the continued fertility and stability of the soil, and enable production to be maintained permanently. The forester can obtain maximum permanent production on land suited to timber production by the use of proper silvicultural practices. The farmer can obtain maximum permanent production under proper agricultural and grazing practices. Unless this is done the farming operations are not on a sound basis. The farmer who does so is achieving soil conservation, and in so doing is maintaining an efficient production plant—his soil. Erosion and maximum permanent production are incompatible.

General Consideration of Practices

Having considered the principal concepts in regard to soil conservation we come now to practices. Here are two general considerations.

(*a*) The first consideration is to treat the area directly suffering erosion, and not the part affected in a secondary way; that is, we treat the catchment of the gully or the stream that is affected and so reduce the run-off into the gully or stream; we treat the broad acres in the north and endeavour to prevent the wind moving the soil. We do not abate the occurrence of erosion on any catchment by constructing works to conduct the accumulated run-off down to gully or stream bed level. No good is achieved insofar as soil conservation is concerned, by planting trees, &c., along roads to catch and hold the drift—we merely change the locality affected.

(*b*) The second consideration is the need to maintain and even to improve soil fertility. Soils of high fertility are better able to withstand the erosive action of both wind and water, than less fertile soils.

Rational use of All Approved Practices

To bring about high fertility, an improved absorption and lesser run-off on water-affected areas and corresponding protection of areas liable to wind erosion, rational use must be made of *all* the means available to the conservationist.

The principal of these are briefly indicated :—

(*a*) The establishment and maintenance of vegetative cover is the most important factor in the direct prevention of erosion and in the rehabilitation of affected areas. This applies whether the land be used for agriculture or grazing; whether it is liable to wind or to water erosion.

Recent investigations have shown that the direct action of rain on bare soil does three things :—

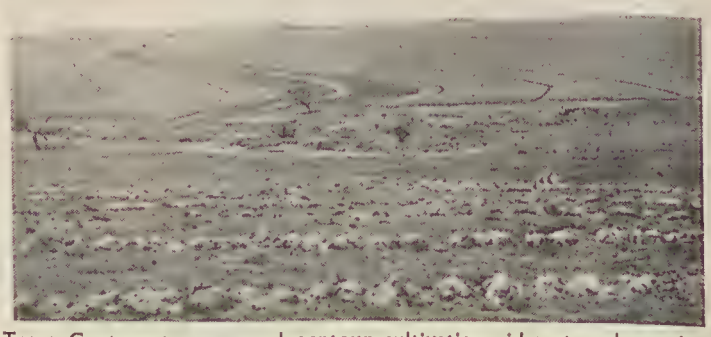
(i) causes a "skin" to form on the surface of the soil which greatly retards absorption; thus is commenced the process of reduced absorption, diminished growth, consequently more erosion, and again less absorption, and so on in a vicious circle.

(ii) causes soil movement by splash, which definitely lifts soil particles and moves them appreciable distances, the greater movement naturally being downhill.

(iii) allows the soil particles that have been disturbed by this splash action to be readily picked up by water travelling over the soil surface.

Conversely, it has been shown that vegetative cover prevents these happenings by cushioning the rain-drop action on the soil surface, and so protecting the soil from this pounding action of the rain drops, and giving also greatly increased absorption. Vegetative cover also provides comparable protection to the soil from the action of wind, by reducing wind velocity at the actual soil surface.

The results of this research work are of great importance, and prove the necessity to maintain vegetative cover at all times, whether the land be used for cultivation or grazing.



Top : Contour terraces and contour cultivation aid water absorption and production. Lower : Contour furrows and contour cultivation here protect a gully.

Under cultivation, increasing thought is being given to "stubble mulch" farming; that is the the practice of retaining stubble or other vegetative growth, instead of burning it as has so often been the practice, and working the soil so as to hold this cover on or near the soil surface, and so allow it to continue to provide soil protection. It is realized, too, that the value of cultivation, as such, has often been over-stressed; that we should cultivate the soil as little as possible consistent with the killing of weeds and the preparation of a seed bed. We should not aim at the maintenance of any fine soil mulch, which has been credited with the virtue of retaining soil moisture; rather should we strive to keep the surface soil in a cloddy condition which will allow maximum absorption of water.

Under grazing conditions, we have the same or an even greater, need to maintain a vegetative cover on the soil. There is here a definite need to re-assess our ideas of the basis of carrying capacity. We have been accustomed to gauge carrying capacity by the total amount of vegetation present, assuming that it could all be safely eaten by stock — even that it is an advantage to do so. There is room for great improvement in our handling of pastures; in the production of better pasture and particularly in their management, so that they may be maintained in maximum production. It is now recognized that the nature of a pasture may be determined just as much by grazing management as by manurial treatment. One need appears to be the more general association of cattle with sheep, so that pasture growth may be economically used without the over-insistence on that "short bite" that is often characteristic of the property devoted solely to sheep-grazing.

(*b*) Next in importance, perhaps, is the use of longer rotations than have been usual over most of our country. This applies particularly to the northern areas of Victoria, where returns from wheat have been such that this crop has

been grown almost exclusively over large areas, often on a so-called wheat-fallow-wheat "rotation", until such time as the country began to visibly suffer and was then allowed a spell in grass. No land can receive such treatment and for long retain its fertility and its erosion-resistant qualities. We have for our better rainfall areas, say 20 inches and over, a very important development in the "clover-ley" system of farming that is emerging from research work being carried out at the Rutherglen State Farm —work that is important because of its bearing on soil fertility in general, on the economics of production, and on the reduction of direct risk of erosion due to the elimination of fallow.

For our areas of lower rainfall, there is a real need for the development of comparable systems, and of research into the production and management of pastures suitable for those areas, so that the period under pasture can compare more favorably economically with the immediate returns from a heavy cropping programme, than is now the case.

(*c*) A definite, and perhaps the most spectacular aid to the farmer who would conserve his soil, is the use of the contour principle in both grazing and agriculture.

Under grazing, the principle is used in the ploughing of contour furrows, which appear likely to play a most important part in all our grazing hill country. Contour furrows are particularly valuable in the treatment of sheet-eroded areas, where the work has to be done to give the rain a chance to soak into the soil, and so allow vegetative growth to take place. On small catchments feeding gullies, the furrows may serve to prevent any water reaching the gullies, and so remove danger of gully extension. A modification is the diversion of water from gullies and other danger spots, to areas where it will do no harm, and where it can often be absorbed with advantage.

Experience has shown that the increased absorption of water due to the furrows gives an increased carrying capacity on areas not so eroded, and the furrows are an insurance against the occurrence of sheet erosion.

The contour principle can be used variously under all forms of agriculture, including horticulture. It can be applied in varying degrees according to the extent of the erosion hazard. Some land is of such nature and slope that the processes of cultivation, however carried out, do not in themselves, constitute an erosion hazard. Then there is land of such nature and slope that contour cultivation alone (the combined effect of all the little dams so formed) will suffice to allow the absorption of all the rain that is likely to fall. Next is land carrying a somewhat greater erosion hazard, but where it is still possible, and desirable, to cause the absorption of all the rainfall by constructing terraces on the true contour, which are called "closed terraces". Where these measures do not suffice, then similar terraces are put in, but these are given a slight fall so that excess water can be carried away around the hill-side to where it may be safely disposed of. In all cases where these graded terraces are used, it is essential that provision

The graded terraces in this paddock convey excess water safely across the hillside to the waterway on the right.

The contour principle applied on a citrus grove in the South Wangaratta district. This grove was planted 50 years ago.

be made for the safe disposal of the surplus water. Where natural waterways are not available, other waterways must be constructed for the purpose, and they must be fenced off so that grazing can be carefully controlled.

(*d*) Then there is the use of manures and fertilizers, and the need here is the rational use of all manures available, to suit the particular soil and the particular purpose.

In Victoria, there is a recognized deficiency in phosphate in our soils, and it is general practice to remedy this shortage by the application of superphosphate to all our crops and, increasingly, to our pastures. There are certain areas where other major plant foods can be applied with advantage. There are, again, other areas where elements required by plants in minute quantities, can be applied with marked results. These are commonly known as "trace" elements (copper, boron, zinc, molybdenum) and the size of the application is of the order of ounces and even parts of an ounce to the acre.

We must use all these fertilizers to enable us to produce maximum quantities of crops and pastures; on our use of such growth depends whether we build up our soil fertility and organic content or whether we deplete them. This matter of organic content of soils and of organic manures has recently received a good deal of attention, and that is all to the good. It is by the maintenance of a satisfactory organic content that any soil is held in a condition in which it can receive and hold large quantities of water, can resist the erosive action of wind and water, and be readily brought to a "good tilth". We have tended to place too little importance on organic content of soil and on organic manures. But we must not go to the other extreme, and assume, now that we recognize the value of organic things, that all else is bad. Artificial fertilizers have their definite uses. In this State they often have been used to build up organic matter by encouraging the growth of legumes, and by the proper management of the resultant produce. There are dangers in their use, however, and they can be used to further exploit the soil; the fault is not in the fertilizer, but in the use made of the growth it promotes.

(*e*) Mechanical structures are another major weapon in combating erosion. There is a definite place for these in the fight against water erosion; so far as wind erosion is concerned, they do not enter into the picture. Such contrivances as "chutes" erected to blow wind from railway lines do not assist erosion control in any way. Various types of drop culverts and other gully-head structures must be used where gullies have once formed, and catchment treatment will not prevent flow into the gullies. Groynes and other structures play a necessary part in the control of stream erosion. In the former cases, mechanical treatment of gully-heads should always be associated with catchment treatment; in the latter case, the mechanical structures are usually relied on only to protect temporarily the stream bank and the vegetation which finally takes over the work of protection.

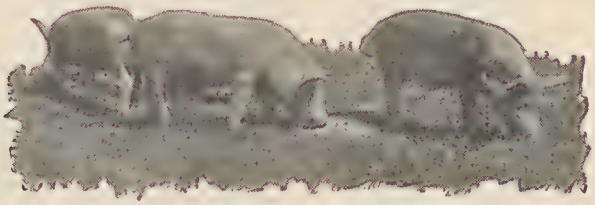
Team-work essential

Finally there is another concept; the concept of team-work in soil conservation. Team-work of two kinds may be mentioned:—

(*a*) between landholders and the many specialists necessary to particular works. In wind erosion these are mainly the agronomists and agrostologists, but there are others, for instance the mechanical engineer in the design of suitable implements. In water erosion, there are parts to be played by surveyors, engineers, draughtsmen, agriculturists in their several varieties, and operators of special plant.

(*b*) team-work in the form of co-operation between landholders. The extent to which the activities of one area affect the well-being of other areas is well-known. Many instances occur where run-off from the high lands causes damage to lower land, often miles away. Comparable cases exist with regard to wind erosion; the drifting sand-ridge menacing a neighbour's home, a road, or a railway.

Effective soil conservation cannot be achieved without this co-operation between landholders and between landholders and the various specialists. Only so can there be initiated a soil conservation programme that will give maximum benefit and equitable cost.



Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-final or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If, at a re-test, any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Abrahams, L. J. ..	Red Hill South	Hawton, I. E. and F. ..	"Rossmoyne," Colac
Baker, J. J.	Bannockburn	Haywood, Dr. A. R. ..	Hastings
Beechy, K.	Pomborneit	Horn, L. A.	Leongatha North
Betts, V. R.	Craig's Lane, Pomborneit	Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Bidgood Bros.	Wodonga		
Bodey, A. A.	"Bonnyview," Dooen	Longerenong College ..	Dooen
Bright, George H. ..	Dumbalk	Marriott, F. C. ..	Bentleigh East
Buller, R. A.	Beaconsfield	Mundy Bros.	Orbost
Castle, L. H.	Clarinda	Noble, T. M. and Sons..	Maffra
Chapple, S. T.	Rye	Northcote Children's Farm	Bacchus Marsh
Coates, R. J. H. ..	Corangamite	Petersen, E. V. ..	Korumburra ..
Cox, H. H.	Jacaranda Stud, Leopold	Richards, Albert H. ..	Dumbalk, via Meeniyan
Critten, H. S.	Dumbalk	Rintoul, J. T. C. ..	Glengarry
Devine, Herbert ..	Swan Marsh	Roy, W. A.	Morrell's Hill, via Boolarra
Dookie Agricultural College	Dookie	Sexton, John	Swan Marsh
Doornbusch, John L. ..	"Starpark," Nhill	Simpson, Ronald D. ..	Birregurra
Dowie, Alexander ..	Mt. Moriac	State Experiment Farm	Rutherglen
Ellwood, A. H. ..	Paschendaele	Trenery and Sutherland	"Promview," Foster
Fairchild and Clutterbuck	Tinamba	Trigg, A. J.	Bungaree
Hamblin, A. T. and Sons	Toolleen	Trigg, N. H.	Bullarook
Hardinge, B. and Sons ..	Nar Nar Goon	Tweddle, J. T. ..	"Winlaton," Shepparton
Harris, Clement C. ..	"Egerton Villa," Loch	Warry, A. and Sons ..	Delburn
Harrison, C. T. ..	"Eastside" Stud, Pomborneit	Whelpton, B.	Whittlesea North
		White, G. W.	Boolarra South

New Wheat Varieties for the Wimmera and Mallee

Pinnacle

A NEW wheat variety, particularly suitable for the Wimmera, has been produced at the State Research Farm, Werribee, and Longerenong College, Dooen. Limited quantities of seed of this wheat are available for distribution to farmers.

The new wheat, which has been named Pinnacle, is a selection from Pindar made by the former Cerealist of the Department of Agriculture, Mr. G. S. Gordon. Pinnacle is a mid-season variety similar in appearance to Ghurka, but slightly taller than that standard Wimmera variety. Like Ghurka and Quadrat it is highly resistant to flag smut disease, and possesses good harvesting characteristics.

In a report on the new variety, the Director of Agriculture, Mr. H. A. Mullett, stated that the wheat breeding programme of the Department of Agriculture included rigorous testing regarding flour quality, and at an early stage Pinnacle had shown flour quality definitely superior to that of Pindar, which itself was a marked improvement on Ghurka. This characteristic has been confirmed, and the production of Pinnacle marked a distinct advance in the objective of improving not only the prolificacy but also the grain and flour quality of Victorian wheat.

Pinnacle should be a very suitable variety for the Wimmera plains, since it has given better results than either Quadrat, Magnet, or Ghurka in four years of replicated tests at Longerenong College. Its average yield at that centre for four seasons has been 24·5 bushels per acre compared with Magnet 23·1, Quadrat 22·6, and Ghurka 20·7 bushels.

In the Western Wimmera at Salisbury, Pinnacle during five seasons has given slightly higher yields than Magnet and Quadrat, but at Kaniva there has been no significant difference between Pinnacle and Magnet. At Charlton also Pinnacle has given a higher yield than the standard wheats. The tabulated results of the Replicated Yield Trials at four Wimmera centres are given in the table below.

REPLICATED YIELD TRIALS (AVERAGE YIELDS PER ACRE).

Variety	Longerenong Average Four Years 1941, 1943–45.*	Salisbury Average Five Years 1941–45.	Kaniva Average Four Years 1942–45.	Charlton Average Four Years 1942–45.
Pinnacle	24·5	30·6	37·8	18·3
Quadrat	22·6	29·5	36·0	17·7
Magnet	23·1	29·5	37·9	17·2
Ghurka	20·7	28·3	33·4	16·6

*At Longerenong, in 1942, experiments were ruined by storm.

The Victorian Wheat Advisory Committee, which consists of representatives of wheat growers, flour millers, bakers, wheat merchants, and officers of the Department of Agriculture, has unanimously agreed to the release of the new wheat, which has been registered with the Commonwealth Registrar of Cereal Varieties.

Insignia

A new wheat variety for the Mallee, Insignia, has been produced at the Research Station, Walpeup. Limited quantities of seed of this wheat are available for distribution to farmers in the Mallee area only.

The new wheat, which has been named Insignia, is one of the many selections made by the Cereal Geneticist of the Department from crosses between the two well-known standard varieties Ghurka

and Ranee. The original cross was made in 1933 and this selection, which has now proved itself to be an outstanding wheat, has been the subject of intensive testing for eight years regarding its prolificacy, flour quality, disease resistance, and other agricultural characteristics.

Insignia is an early wheat, maturing earlier than either Ghurka or Ranee. It has a short, strong straw, slightly taller than Ghurka, and stands better than most early types. Like Ghurka, it is resistant to flag smut and is less susceptible to rust than Ranee. It produces a semi-compact, red chaffed head with short awns, and has proved easy to thresh at harvest without showing any tendency for the grain to crack. Insignia normally produces a medium-sized grain with flour at least equivalent in baking quality to its Ranee parent and superior to Ghurka and Quadrat.

On evidence obtained to date, Insignia may prove to be the most prolific wheat grown under Mallee conditions. Apart from preliminary tests made prior to 1940, it has given consistent and outstanding results in replicated trials at the Mallee Research Station during the last six years, and also in trials conducted on private farms at Woomelang, Ultima, and Berriwillock. At the Research Station its average yield of 18·3 bushels per acre is 1·3 bushels more than that of the next most prolific variety, Quadrat (17·0 bushels per acre). At Woomelang, Insignia gave an average yield of 17·7 bushels per acre compared with 16·9 bushels produced by Bencubbin. At Ultima, where the seasons have been less favourable, Insignia has produced an average yield of 9·6 bushels per acre during the past five years, the next highest being Regalia with 9·1 bushels, whilst at Berriwillock the comparison is 15·4 bushels from Insignia compared with 14·1 bushels from Quadrat.

AVERAGE YIELDS PER ACRE.

—	Walpeup Six Years 1940–45.	Woomelang Five Years 1941–45.	Ultima Five Years 1941–45.	Berriwillock Four Years 1942–45.
Insignia ..	18·3	17·7	9·6	15·4
Regalia ..	16·6	16·7	9·1	13·5
Ranee 4H	16·2	16·6	8·8	14·0
Bencubbin	16·9	16·9	9·0	—
Pindar ..	15·9	13·0	7·5	12·9
Quadrat ..	17·0	13·8	7·9	14·1
Ghurka ..	15·2	12·4	7·8	12·6

The Victorian Wheat Advisory Committee, which consists of representatives of wheat growers, flour millers, bakers, and wheat merchants, together with officers of the Department of Agriculture, has unanimously agreed to the release of the new wheat for the Mallee.

NOTE.—Approximately 1,600 bags of graded seed of these two new wheat varieties have been distributed in three-bag lots since their release was announced early last month, and no further orders can be accepted this year

LEAF VARIEGATION IN FRUIT TREES

An irregular yellow mottling of fruit-tree leaves known as infectious leaf variegation has been noticeable again this year. This minor disease, which occurs principally on apples, varies in amount from year to year but does not spread in the orchard. It may dwarf the leaves slightly and make them susceptible to spray injury and may even appear in the fruit, but on the whole it does not seriously affect the tree.

Leaf variegation is fairly common in cherries also, particularly the variety St. Margaret. In cherries it appears more as a silver-grey mottling, and usually results in slight stunting of the branch or tree affected. It may occur also in other stone fruits and in pears.

There is no known cure for leaf variegation. It seems to be due to a virus which is spread by budding and grafting. Its spread therefore can be checked only by choosing scions from trees which have not shown any sign of variegation, but even this is not a sure way, as some varieties which do not show symptoms can transmit the disease to others.

[Contributed by the Horticultural Division.]

THE STICKFAST FLEA OF POULTRY

By A. R. GRAYSON, B.V.Sc., *Senior Veterinary Officer*

The stickfast flea *(Echidnophaga gallinacea)* of poultry is an external parasite which can have serious economic results. The severe irritation set up by infestation results in a considerable loss of egg production caused by the ill-health and progressive emaciation of infested birds. Death is not an uncommon sequel. Added to this, the cost of control and eradication is quite considerable both in money and labour. Moreover, the Poultry Stickfast Flea is a scheduled disease under the *Stock Diseases Act*, so that any outbreak, which is immediately notifiable, results in restrictions on the movements of poultry including pigeons both interstate and intrastate. This can seriously affect the interests of commercial poultry breeders.

Identification

INFESTATION of poultry by these fleas is usually easy to recognize. The fleas, which are reddish-brown in colour and smaller than body fleas, are found attached to the areas of skin devoid of feathers, particularly of the head, comb, and wattles. They are often in clusters of one hundred or more. The flea may also infest pigeons and wild birds and be found on dogs, cats, horses, &c., and wild animals, particularly rabbits, rats and mice. It should be noted, however, that another allied species *Echidnophaga myrmecobii* is more commonly found on these animals and it is necessary to forward specimens to the Department for differential diagnosis.

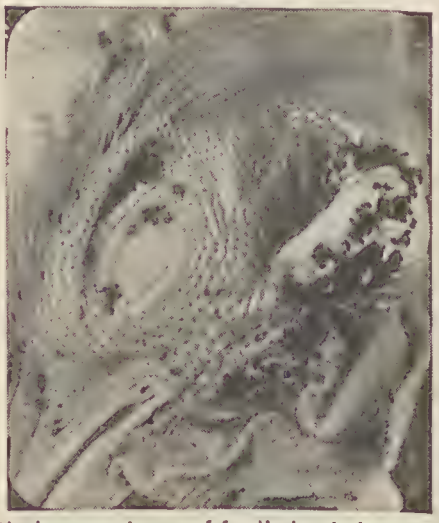
Life History

There are four distinct stages in the life history of the flea and the duration of each stage varies considerably according to conditions of temperature and moisture. Under favourable conditions, i.e., humid summer conditions, the stages are as follow :—

1. *The egg* is dropped by the female flea while attached to the host bird or animal. It falls to the ground and hatches in from four to six days. Each female flea is capable of laying a relatively large number of eggs.

2. *The larval or maggot stage* lives below the surface of the soil or litter and moves about freely in search of food, which consists of partly-digested blood of the host animal which has been evacuated in the droppings of the adult flea. Organic matter, both animal and vegetable, contained in fowl droppings, is also food for the maggot. During the growing period (two to three weeks) the maggot undergoes two moults.

3. *Pupal or cocoon stage* :—After undergoing the second moult and maturing, the maggot, which is below the surface of the ground, spins a silk-like cocoon around itself, incorporating particles of sand, dust, &c., in the cocoon. Within this cocoon, the maggot sheds its final skin and enters into a resting or hibernating stage (fourteen to sixteen days). From this stage the adult flea emerges.



A close-up picture of fowl's head showing stickfast fleas attached.

4. *Adult stage* :—The adult flea is small and dark-brown in colour. It has a complex mouth-part consisting of barbed and pointed organs, which enable it to pierce the skin of the host and to adhere to the site. The barbed arrangement also makes it difficult to remove the flea intact. The fact that the stickfast flea remains adherent to the host during the whole of its life distinguishes it from ordinary fleas.

Symptoms

The symptoms caused by the infestation are due primarily to the irritation set up by the fleas and to the anæmia produced by the feeding of often large numbers of the fleas. The wasting

and emaciation so produced will often result in the death of young birds and a lowered production among older birds. There is no evidence to show that the flea might carry infectious disease agents to poultry.

Treatment

The treatment of infested birds is relatively simple, but requires the individual handling and thorough inspection of each bird.

The application of a bland oil, i.e., neatsfoot, castor, &c., applied once a week with a small brush to affected parts or to the more exposed parts likely to be affected will be sufficient to kill the fleas present.

Alternative dressings could be sulphur 1 part, vaseline 4 parts, or kerosene 1 part, lard 3 parts. In heavy infestations the birds could be dipped in a 2 per cent. phenol solution or could be

The stickfast flea.
(Enlarged.)

thoroughly dusted with derris powder 1 part, talc 2 parts. Similar dressings should be applied to dogs and cats. Experimentally, the application of D.D.T. emulsions and powders has given good results. Poultry may be sprayed with an emulsion of D.D.T. diluted with water to contain approximately ½ to 1 per cent. D.D.T., taking care that all affected areas, including under the feathers of the neck, &c., are treated. This may be repeated on one or two occasions, but treatment of the birds must be coupled with treatment of the floors, which is preferably done by the application of a 5 per cent. D.D.T. powder, or by spraying at frequent intervals with a 15 per cent. salt solution, to keep the floors damp and destroy the eggs and larval forms of the flea and so prevent re-infestation of the birds.

Treatment of cats is preferably by use of a dusting powder of 5 per cent. strength of D.D.T. in some powder base, such as talc, or an earth such as pyrophilite, care being taken not to use too much of the powder as the drug is poisonous and cats are in the habit of licking themselves and tend to ingest a toxic amount of the drug. Dogs should preferably be sprayed about the infested parts, a careful examination being made to detect these areas. Treatment can be repeated once or twice to eliminate all fleas. Cats and dogs should not be allowed to enter the poultry runs where re-infestation is likely to occur.

Control

Where poultry are housed hygienically under intensive or semi-intensive conditions, satisfactory control measures can be carried out. Under these conditions, the floors of sheds would be impervious. A preliminary spraying should be done before the sheds are cleaned. Suitable sprays include tar-oil, sheep dip, kerosene emulsion, &c. This preliminary spraying will eliminate many fleas, their eggs and larvæ, and will prevent the escape of other fleas. The house cleanings and all rubbish should then be gathered and burnt, adding additional oil or kerosene to ensure complete destruction.

A final spraying of the house will kill those fleas remaining in crevices. Repetitions of this treatment at ten-day intervals are advisable.

Poultry, dogs, cats, rats, &c., should be screened away from under buildings as they may serve to perpetuate flea invasions.

If the floors of the buildings are not impervious, they should be thoroughly saturated with a strong salt solution as indicated previously. Nests, feed boxes, &c., should be constructed of tin or iron and should be raised from the ground. Any runs or yards should be kept free from litter and debris, and shade-trees should be lopped so as to allow the direct sunlight to penetrate to all parts of the run during the heat of the day.

Where poultry farming is a side-line or where poultry are kept under open-range conditions, control becomes much more difficult. Under these conditions, poultry roam at will into sheds, stables, haystacks, &c., and roost in trees. The mounds of excreta under the trees and the nests under hedges, in haystacks, and elsewhere, become, if infested birds are present, prolific breeding grounds for the flea. To control the infestation, the birds must be securely yarded and forced to roost in properly-constructed houses, when the measures previously outlined can be carried out.

In all cases it is important to remember that infestation can be spread by transport; i.e., crates and through poultry markets, and indirectly by cats, dogs, rats, and rabbits, as well as by the owners of infested poultry carrying the flea on their clothing. As previously indicated, the condition is scheduled under the Stock Diseases Act and it is incumbent on the owner of any infested poultry to report the presence of the flea to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

THE SHEEP MITE

The Sheep Mite (*Psorergates ovis*) is a mange mite parasite of sheep, and its incidence in Victorian flocks has been observed only in recent years.

Clinical observations of infested sheep show that they bite at affected parts of the skin and also rub against fences, logs, &c., to relieve the irritation. This results in the wool becoming matted or felted and ragged in appearance, and this is especially noticeable immediately prior to shearing when the staple of wool is longest. The shorn fleece lacks character and is of little commercial value. In the paddock, a badly infested sheep will give the typical appearance of being infested with lice, and in those cases where a close examination fails to reveal any lice (these can be seen with the naked eye) the mange mite parasite should be suspected. As the *Psorergates ovis* mite is microscopic in size and located actually within the tissues of the skin, an accurate diagnosis can be made only in a laboratory.

It is not usual to find more than about 25 to 30 per cent. of infested sheep in the average flock, and experiments have shown that the transmission of the mite from infested to healthy sheep, which is only by direct contact, commonly occurs during the three months following shearing, that is, while the staple of wool is short.

For the treatment of infested sheep, dipping in a solution containing at least 1 per cent. polysulphide sulphur and a suitable wetting agent (Agral 3) has proved to be effective. Commercial lime-sulphur concentrates for making this dip are on the market. The inclusion of a wetting agent is necessary to dissolve the fats in the wool and skin, and allow the fine sulphur particles greater penetration. Owing to the difficulty of recognizing recently infested cases, it is recommended that all sheep be dipped at the same time.

[Contributed by the Live Stock Division.]

Certified Pullorum Tested Flocks

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

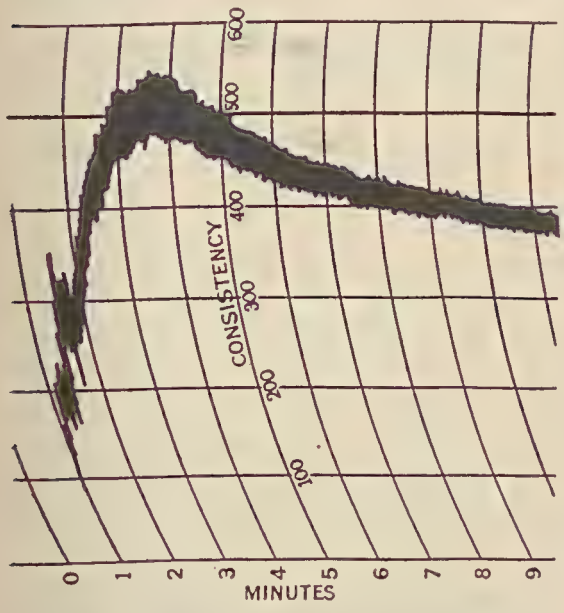
Owner.	Number of Birds.
Batey, L. J., Katandra North, via Yabba North ..	1,206
Becker, F. W., Follett-road, Cheltenham	559
Corbett Bros., Noel-avenue, Macleod	2,164
Christie, R. R. & Son, "St. Elmo" Poultry Farm, Tucker-road, Bentleigh, S.E.14	587
Davidson, Mrs. A. C., 22 Sherbrooke-avenue, Ringwood	142
Emmott, E. & T., Inglewood Poultry Farm, Verdon-street, Inglewood	283
Fellows, J., Yan Yean-road, Plenty	830
Gage, K. L., Clarke-road, Spring Vale	444
Giarrusso, G., Lower Dandenong-road, Braeside ..	770
Gibbs, Mrs. M. M., "Lomas," Yan Yean	71
Giovanetti, G. E. Skene-street, Kennington, Bendigo ..	385
Grosvenor, Messrs. E. W. and E. K., "The Haven" Poultry Farm, Springvale South	574
Hall, R. H., Wal Wal	884
Harrison, Mrs. A. M., Stenfield-street, Cobden	93
Jenkins, A., "Pen-y-bryn," Ridge-road, Kallista ..	524
Kostos, D., Cr. Collins and Waverley-roads, Oakleigh..	1,302
Lang, John, 46 Dundas-street, Thornbury	74
McTighe, C. H., Nar Nar Goon	444
Nichols, Mrs. Ella M., "All Red Poultry Farm," Yan Yean	543
Power, M. J., 8 Danin-street, Pascoe Vale, W.8 ..	858
Salmond, J. B., "Peerless" Black Leghorn Yards, Deer Park	245
Waldmann, F., "Karale" Poultry Farm, Greythorn-road, North Balwyn	584
Wohlers, S., Box 17, Jung	261

VICTORIAN F.A.Q. WHEAT

Analysis of 1946 Sample

By E. J. O'BRIEN, A.A.C.I., Cereal Chemist

A PORTION of the official F.A.Q. wheat sample, made available by the Victorian Chamber of Commerce, has been critically examined. The results of analysis and of milling and baking tests, with comparative figures for the previous seven years, are tabulated on the next page.



Farinogram for 1946 sample of F.A.Q. wheat.

Following on the drought of 1945, seasonal conditions for this crop were erratic and, consequently, are reflected in both the yield and in the quality. Although good rain was received in June and conditions appeared promising, this rain did little to replenish the depleted moisture reserve of the sub-soil, and a very dry spring caused a general set-back to crops which, in many cases, did not recover with later rains. The estimated harvest is 28½ million bushels compared with the average of 36 million. In addition to reducing yield, the dry conditions caused the wheat plant to synthesize less starch than usual and, consequently, the protein content of this F.A.Q. sample is higher than for the preceding six years.

Rain in January and February found some crops still unharvested and resulted in general bleaching and, in isolated cases, severe damage with sprouting. Although sprouted wheat has been excluded from this sample, some bleached grain is present and the bushel weight was struck at 62½ lb., which is lower than that for wheat harvested before the rain.

The F.A.Q. sample consists of a blend of 230 individual samples representing all districts in the State, and including both bulk wheat from silos and bagged wheat. The proportions from different zones used in making the sample was as follows :—

	%
Mallee	30
Wimmera	36
Northern	14
North-East	18
South-Central	2

Wheat

The colour is generally bright and the grains are well filled, but occasional bleached grains detract from the general appearance. The soft wheat varieties predominate, as is indicated by the Pelshenke figure of 32 minutes. The dockage present is not excessive, consisting mainly of small grain less than 2 m.m. diameter, with some broken grain, husk, straw and a few weed seeds. Cleaning the wheat increased the Bushel weight from 62½ lb. to 63 lb.

The protein content as mentioned previously is higher than usual, and although the F.A.Q. sample can be misleading in some seasons due to wide protein variations between districts, for this season high protein contents have prevailed throughout the State, and the sample is, therefore, a better indication of the protein to be expected from relatively small consignments of wheat.

TABLE I.—ANALYTICAL RESULTS—WHEAT.

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Moisture (per cent.)	9·1	10·7	11·0	10·5	11·2	11·2	11·8	11·7
Impurities (screenings) (per cent.)	3·4	4·1	3·8	5·3	3·7	4·9	4·1	4·7
Ash (per cent.)	1·26	1·43	1·20	1·23	1·20	1·20	1·19	1·36
Protein (N x 5·7) (per cent.)	12·8	9·8	11·7	10·3	11·1	10·4	11·5	11·8
Bushel weight (lb.)	64½	63½	64¼	63¾	64¼	65	63½	62½
Pelshenke figure (min.)	36	26	39	32	33	37	35	32

TABLE II.—ANALTYICAL RESULTS—FLOUR.

—	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Moisture (per cent.)	11·1	12·6	12·4	13·2	13·6	13·4	13·4	14·0
Yield (per cent.)	71·3	72·9	73·2	70·0	71·7	70·0	72·0	70·3
Ash (per cent.)	0·54	0·48	0·47	0·48	0·46	0·40	0·44	0·43
Protein (N x 5·7) (per cent.)	11·2	8·8	10·4	9·0	10·0	9·0	10·3	10·5
Wet Gluten (per cent.)	38·7	28·8	30·8	25·7	30·0	28·0	35·0	31·3
Dry Gluten (per cent.)	12·2	9·5	10·4	8·6	10·1	9·4	10·9	10·3
Water Absorption (Farinograph) (per cent.)	63·0	57·4	61·8	57·5	57·5	55·4	59·6	60·0
Valorimeter No. (Farinograph)	46	42	44	38	39	39	38	38
Maltose Figure (mgrms. Maltose per 10 gms.)	168	155	152	142	110	108	107	111

TABLE III.—STANDARD BAKING TESTS (100 GRM. FLOUR)—LOAF VOLUME IN C.C.

Formula.	1939.	1940.	1941.	1942.	1943.	1944.	1945.	1946.
Basic	397	392	442	440	440	405	425	477
Basic + malt + phosphate	475	460	517	475	490	475	494	550
Basic + malt + phosphate + bromate	517	497	561	460	505	515	592	555

Flour

The cleaned wheat, conditioned to 14 per cent. moisture, milled freely to give a normal yield of clear, bright flour, of low ash content.

The maltose figure and gassing power are both lower than is necessary for a satisfactory baker's flour, but this fault may be corrected by the addition of malt extract, malt flour, or malt-flour base improvers.

As the gluten content is at a reasonable level for bread-making, there should not be any complaints from either bakers or consumers regarding flour quality this season. It has been found that, for Victorian flour, there is a minimum gluten content, below which unsatisfactory bread will result, irrespective of the quality of the gluten or the wheat varieties constituting the millers grist. Frequently when flour quality is criticised, the wheat varieties are wrongly blamed without regard to total gluten content, which depends in part upon such factors as seasonal conditions and soil fertility.

The curve illustrated is that produced by the Brabender Farinograph. The water absorption is above average and the curve is satisfactory with regard to mixing tolerance and stability.

The results of the Standard baking tests are given in Table III. The basic loaf had the greatest volume yet recorded since this test was adopted for testing the F.A.Q. wheat. The

(*Continued on page 158*)

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

Lime for Dairy Cows

ALL grain and concentrates, with the exception of meat meal and milk by-products, are deficient in calcium and at least 1 per cent. of lime in the form of ground limestone (calcium carbonate) should be added to concentrates such as grain when fed to live stock.

An analysis made by the Council for Scientific and Industrial Research showed that by top-dressing with superphosphate, the phosphate content of the pasture was increased by 50 per cent. while the calcium (lime) content was unaltered. Top-dressing, therefore, upsets the ratio between the calcium and phosphate in the herbage, although it corrects phosphate deficiencies. By upsetting the calcium-phosphate ratio, top-dressing with superphosphate may emphasize any lime deficiency and would help to explain the contentions of many farmers that their cows benefit by a dietary supplement of limestone.

On pastures top-dressed with superphosphate, the feeding of a lick containing from 50 to 80 per cent. of salt and 50 to 20 per cent. of ground limestone is recommended. The lime may be fed in bail feed or in the water supply; when added to the drinking water it should be in the form of hydrated lime. In some instances, lime is regularly added to the water troughs and in this way the small quantities which are dissolved are drunk by the stock.

The supply of a lick containing 50 to 80 per cent. of salt, 25 to 10 per cent. of ground limestone and 25 to 10 per cent. of bone meal or dicalcic phosphate is recommended on farms where top-dressing is not practised.

Fruit for Pigs

Fruit is good for pigs, but it should be used only as a supplement to other foods. Many pig-raisers are able to obtain waste apples and other fruit for pig feeding, and provided the cost of the fruit delivered to the pigs is not too high, it can be fed with profit.

The monetary value of fruit for pig feeding is difficult to assess, but approximately 7 lb. of apples are equal to 1 lb. of grain in pig feeding value.

The experience of some pig-raisers in feeding fruit to pigs has led them to believe that this practice is harmful, resulting in slow growth, small litters, and even causing milking sows to go dry. Such troubles are likely to occur only if fruit is fed excessively, and if the pigs are not given an adequate supply of the more nutritious foods such as grain and milk or meatmeal.

The food requirements of pigs are somewhat similar to those of humans; fruit is very valuable in the diet of humans, but nobody would expect a child to grow normally or a man to do hard work if the diet consisted mainly of apples and excluded the more solid foods. The same principle applies to feeding pigs.

If pigs, from weaning to baconer size, and dry breeding sows are given at least 2 lb. of meals or 2 gallons of separated milk per head daily, and if sows with litters are given at least 6 lb. of meal or say 4 lb. of meal and 2 gallons of milk per head daily, then, in addition, they may be fed as much fruit as they can eat with satisfactory results.

Even though dry sows will put on condition and appear to be thrifty if fed entirely on fruit, they will not be able to produce and rear really good litters.

[L. A. Downey, H.D.A., Pig Expert.]

Apiary Research in Russia

The following is a summary of a report, by Professor Ashby, Scientific Liaison Officer, on the work being conducted by the Russian Scientific Research Institute for Bee Culture, Moscow Oblast, Butovo.

The Institute is divided into ten departments connected with all phases of apiculture. In the pollination department interesting work is carried out with the pollination of red clover, lucerne, sunflower, and numerous other plants. Inheritance of nectar production and the rate of nectar production by individual flowers are also being studied.

A study of the relation between the amount of clover seed set in a crop and the distance between a bee-hive revealed that the mean distance travelled by bees for pollination varies with temperature, sunshine, and other weather conditions.

Studies are being made on the tripping of red clover and lucerne flowers. In red clover it was found that 34 per cent. of the tripping was due to honey bees, 44 per cent. to wild bees, 8 per cent. to other insects, and 24 per cent. to other causes. With lucerne the frequency of tripping of the flowers increases rapidly from 8 a.m. until about mid-day, and drops sharply to a minimum at about 1 p.m. and rises again in the afternoon. Strains of clover with short corollas have been developed and these strains can be pollinated by honey bees.

In the department dealing with bee behaviour, bees have been trained to pollinate certain flowers only, and in this way fairly pure strains of honey are produced. Where seed production is important, bees are regularly trained in this way to pollinate certain flowers, and as soon as one crop is finished flowering and another begins, the bees are trained to pollinate the new crop. By using trained bees, seed production has been increased over four times above that of fields where pollination is effected by untrained bees. In addition, the trained bees are said to store five times as much honey as untrained ones.

The method of training bees is simple. If bees are required to pollinate lucerne flowers, dishes of 50 per cent. sugar, 50 per cent. water solution are put into the hive above the nest; lucerne flowers are placed in these dishes. The flavour from these flowers encourages the bees to pollinate lucerne to the exclusion of almost all other plants. The training takes from two to three days and the effect lasts for the whole of the flowering season. Where seed production is important bees are regularly trained in this way. As soon as one crop is finished flowering and another one begins the bees are trained to pollinate the new crop.

Work is also being carried out on artificial swarming and collection of pollen by simple pollen traps, the selection of bees for winter production, and honey and wax production.

At the Institute, Caucasian queens, which pollinate at lower temperature than Italian queens, have been produced.

Seasonal Hints for Apiarists

With the honey season drawing to a close, weak colonies should be examined, and where the bees have failed to gather a surplus sufficient

to carry them through the winter, they should be assisted by transferring combs containing sealed honey from colonies that have stored more than their winter requirements. This operation should be carried out before commencing the final extraction from the stronger colonies.

The quantity of sealed honey given to a weak colony should be governed by the covering capacity of the cluster of bees within the hive. The hive entrances of weak colonies should be contracted to a space of not more than two inches wide and all lids snugly and securely fitted.

Migratory apiarists with bees working on grey box and yellow-gum blossoms, should extract all unsealed honey and remove their bees from the vicinity of the bloom by the end of the month. Water-saturated nectar, gathered from these sources during winter months, is a cause of heavy mortality of bees during the early spring.

Coastal sites, protected from the prevailing winds, should be occupied as early as possible. The coastal areas, compared with higher inland altitudes, are warmer and not subject to such heavy frosts, enabling the bees to indulge in cleansing flights at comparatively short intervals.

[J. W. Thomlinson, Apiary Inspector.]

Poultry Notes

The systems under which poultry is kept are commonly referred to as intensive, semi-intensive, and free-range. The interpretation of these terms varies and applies particularly to the laying stock. Under intensive conditions, the birds are confined to their laying quarters permanently for two laying seasons, or perhaps longer, after being reared to near-laying stage. Birds should be allowed approximately four square feet of floor space each; they should be kept in groups of about 100 and bred from strong, properly-fed stock, well reared in clean surroundings.

Birds allowed out occasionally in small runs in front of the laying pens show improved health, but under these semi-intensive conditions, the ground should be turned over frequently to reduce contamination from diseases and parasites.

Allowing adult laying fowls free range over larger areas of land, with roosting quarters only at night conforms more to natural conditions, but decreased egg production usually occurs.

Chickens are often reared under intensive conditions, such as in battery brooders, or inside brooder houses, with practically no free range before being placed in the laying pens, but it is better to allow chickens for egg production the use of grass runs, where they will receive ample direct sunshine and green feed for strong, healthy development.

There may be good reasons why adult laying birds should be kept under intensive conditions to obtain the maximum number of eggs, but it is preferable to rear young stock under more natural conditions.

[H. F. Clinton, Poultry Expert.]

VETERINARY NOTES

Actinomycosis (Lumpy Jaw)

Actinomycosis, an infectious disease of stock, is one of the diseases for which compensation may be claimed under the Cattle Compensation Act. It affects cattle chiefly, but horses, sheep, pigs, and humans are also susceptible.

The disease is caused by the "ray fungus" organism, which is resistant to antiseptics, heat, and sunlight, and may therefore persist in the pasture and soil for years. Infection occurs through some abrasion or wound of the mouth or tongue, for example that caused by grass seeds and the loss of teeth, particularly in young stock.

The disease commonly sets up in the jaw bones and surrounding facial bones. The swelling produced by this disease is due to the destruction and rarefaction of bone together with the development of granulation tissue and the formation of new bone. When a swelling, which can become very large, is cut it looks spongy with pus filling the cavities. As a result of this removal of bone, teeth may fall out. Abscess formation may develop by the swelling involving the adjacent skin and hence pus is discharged to the exterior surface of the jaw.

Actinomycosis is a chronic, slowly-growing, persistent disease and may last for months or even years before it causes the death of the animal. The effects depend on the location of the growth and the interference caused to the natural functions of those parts; for example, affection of the jaw resulting in loss of teeth and improper chewing.

Prevention is not easy since any discharging abscess contaminates the pasture. Strict isolation or disposal of the affected animals will help to check its spread to other animals.

Treatment is not always 100 per cent. effective but the trouble can be relieved. Either sodium or potassium iodide can be given daily for a week as a drench or in the feed at the rate of 1 to 2½ drams per day, according to the size of the animal. After one week's treatment, allow a week to pass before resuming treatment for a further week. If any scurfiness of the skin, running at the eyes and nose, and loss of appetite are noticed, stop treatment immediately for a week and then resume. It is not advisable to give iodine to cows heavy in calf. If a veterinary surgeon is consulted, he may prescribe surgical treatment and/or intravenous injection. The disease may be found in other parts of the body—lungs, udder, skin.

All suspected cases of actinomycosis should be reported to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

VICTORIAN F.A.Q. WHEAT (*continued from page* 154)

addition of malt flour and ammonium phosphate produced a significant improvement in volume, external appearance and crumb texture. However, the addition of potassium bromate did not cause the improvement normally observed. The bromate loaf was overmature, whereas the malt phosphate loaf was taken at correct maturity. The doughs were lively, handled well, and produced attractive loaves with three vastly different formulæ. Although optimum conditions are not necessarily provided in this type of test, the results indicate that this season's flour possesses considerable tolerance and will make high quality bread by normal commercial methods.

HYDATIDS IN DOGS

The most effective drug for the removal of the hydatid tapeworm from dogs is arecoline hydrobromide. One ½-grain tablet of the drug is dissolved in 2 tablespoons of water, and given in doses varying from 1 teaspoonful for puppies and small dogs up to 2 to 4 tablespoonsful for greyhounds and other large dogs.

Certain precautions are necessary when dosing a dog. For best results, starvation overnight is necessary. Chain the dog up immediately after treatment and keep it chained up for some hours until all effect of the drug has passed off. Preferably the patient should be kept on a hard surface which will permit the ready collection of all fæces passed.

Farmers carrying out the treatment on their own dogs, should realize that the first motion passed will contain relatively few worms, the majority being passed in the later-fluid motions. All fæces passed after treatment must be carefully collected and burnt to obviate the drying and consequent liberation of mature eggs.

Owing to the small size of the worms, especially when immature, it is possible to overlook them, even when large numbers are present in the fæces, so that the collection and burning of all fæces, after each dosing, must be a routine part of the treatment. Treatment should be carried out, again as a routine, each eight weeks.

The second avenue of control aims at the prevention of re-infestation of the dog. Raw offal should not be fed to dogs. All offal fed should be boiled for at least ten minutes to render sterile any cysts present.

[Contributed by the Live Stock Division.]

BOTULISM IN HORSES, CATTLE AND SHEEP

By the
Veterinary Officers, Live Stock Division

BOTULISM is a food poisoning caused by eating fodder containing the toxin or poison produced by a microbe (*Clostridium botulinum*) which grows and multiplies in decomposing fodder or in the carcasses and bones of animals and birds. The microbes attack dead tissue only, and it is the poison produced in this dead tissue, that, if ingested with the food, produces the disease. Botulism is not infectious nor contagious, it is not transferred from one live animal to another, nor is it necessary for the germs to enter the living animal. The toxin, which is soluble in water, is one of the most powerful poisons known. In common with other bacterial poisons it produces its effects only after an interval, which is from three to seven days.

When growth and multiplication of the organisms cease because of lack of certain essential conditions, spores are formed. These spores are very resistant and will retain their vitality even when dry, when they may be carried about in dust or other dry material.

The organisms live in decomposing animal or vegetable material. Warmth, moisture and an absence of oxygen (or air) are essential for their growth and multiplication.

The fact that an absence of oxygen is necessary for growth probably prevents the disease from being more common. It is found, however, that the microbes can grow in decaying material exposed to air, provided moulds are present. Moulds grow on the surface of material, but immediately beneath the mould, the oxygen of the atmosphere is used up and thus conditions are made suitable for the multiplication of the organism. At one time it was thought that the disease was attributable to the moulds, but whereas mouldy fodder itself may produce slight digestive disturbance it will not produce the disease we now term botulism.

Sources of Causal Organism

Sources of the causal organism and its toxin are as follows :—

(1) Hay, chaff, or grain damaged by water, and probably mouldy.

(2) Fodder contaminated by mice.

(3) Fodder in mangers contaminated by dust or water percolating from old straw-covered stables.

(4) Old grass paddocks of a tussocky nature, or long stubble trampled into a mat.

(5) Butts of stacks : cocky chaff left in paddocks after harvesting.

(6) Decomposing manure or manure-contaminated fodder.

(7) Water polluted by stable drainage.

(8) Bones and decomposing carcasses.

The disease has a seasonal incidence, mainly because fodder is most likely to be damaged by the warm summer and autumn rains during harvesting and storing operations. Mouse plagues also may take place in the autumn.

The nests of mice and the bodies of dead mice in fodder form ideal conditions of warmth and moisture for the growth of moulds and other organisms, and if *Clostridium botulinum* is present toxin will develop. These facts explain why the disease is more prevalent in mice plague years, when it is a difficult matter to protect hay, chaff, and grain from contamination by mice. In times of drought also, numbers of cases occur, for, consequent on scarcity of good fodder, damaged hay and grain are used for feeding stock.

It is possible also that mice may carry the germs from the soil into chaff or hay, where the germs may grow and multiply in and around the mouse nest and produce the toxin. Further, the mice may carry minute pieces of decaying vegetation impregnated with the poison into clean sound fodder.

Many cases investigated in northern Victoria have been traced to old straw-covered stables, particularly if the mangers are situated where rainwater can percolate through the straw and drop into the feed. These old straw roofs form good conditions for vegetable decay, as well as harbours for mice and birds. They act as stores for the bacterial poison which, being soluble in water, is readily carried through by rain water.

Pasture Infection

It is interesting to note that outbreaks of botulism have been reported where animals were not hand-fed, and had no access to decaying vegetable refuse. Investigation disclosed that the poisonous fodder consisted of dead and decaying grass found at the base of tussocks and tufted grasses. Mouldiness is often seen around the bases of such tussocks and this is a condition suitable for the development of the poison. Other material in the field in which the causal organisms will thrive is cocky chaff from winnowing during harvesting or threshing operations and stooks and sheaves left in the paddock after hay carting; this material, if damaged by rain, will decay and may become infected.

Manure of any animal is, of course, decomposing material, and as it is moist and warm, forms a suitable medium for the production of toxin of the organism of botulism. Cases of the disease have been traced to the eating of fodder contaminated by poultry manure, while it is not uncommon for animals to have a depraved appetite, in which case they will actually eat dung.

There is always a danger of botulism in paddocks where dead grass and tussocks have been trampled into a thick mat.

Other outbreaks have been traced to pollution of the water supply. One striking instance of this was brought under the notice of the Department by a private veterinarian. Two horses died from botulism some few days after having been allowed to water from a surface dam into which drainage from the stable and stable-yard found its way. No other likely source of the poison was discovered. On inquiry, it was found that some seven or eight years previously horses had died from botulism on this property, and the officer investigating had advised the owner to fence off this dam. This was done and no further cases occurred until, through failure of a windmill, the horses were allowed access to the dam water.

Another means of pollution of water is in the trough that contains a matted growth of algae. Dust containing spores may inoculate this material and the soluble toxin produced will then disseminate through the water in the trough.

Owing to the solubility of the toxin, it may be washed from the part where it was produced to an apparently clean portion of the fodder, and further, owing to the interval of time between the eating of the fodder and the development of symptoms, it is often difficult to obtain a sample of the poison-contaminated fodder.

BOTULISM IN HORSES

The symptoms of botulism vary somewhat, but in general they are marked by paralysis of the various muscles. The animal becomes dull and listless and there are irregularities in its gait; it may knuckle over and stumble as it moves along. The eye is noticeably dull and the eyelids are often partially closed, and the head appears to be "heavy". In many cases there is interference with eating, mastication and swallowing and strings of saliva and wisps of fodder may be seen hanging from the mouth.

Later the paralysis of the various muscles increases, and the animal becomes prostrate, often showing a paddling movement of the limbs while in such position. Acute cases sink into a semi-comatose condition, and death takes place in a few hours. In those cases in which the patient eats and

drinks, the disease will run a chronic course for several weeks if slinging is carried out. Even then, however, a favorable prognosis can rarely be given.

Because many animals have access to the same poisonous forage, it is usual for more than one animal to be affected, but the disease is not transferred from one live animal to another. Consequently, it is well to consider the treatment of horses, which, even though not showing symptoms, have had access to the same food as the sick horses.

Ample supplies of pure drinking water should always be available to farm live stock

Treatment

Botulism has a particularly high mortality rate and few animals recover. The actual monetary loss to any one farmer may easily run into hundreds of pounds, while the loss resulting from the shortage of working horses on a farm on which there are several cases is difficult to compute.

Where horses lapse into coma or unconsciousness, nothing can be done, and farmers with experience of the disease usually destroy the animal rather than allow it to linger as a hopeless case. It has also been observed that many horses, in which treatment has apparently prevented death, may remain partially paralysed. Subsequent usefulness of such animals, however, is greatly diminished.

In those cases in which treatment is deemed advisable, that is if the horse is still fairly bright and eager to eat and drink, arrangements must be made to have the animal placed in a sling. It should be noted early that slinging and treatment are quite useless unless the horse can stand of his own accord; the sling is merely to provide a standing, resting posture and to prevent falling.

An immediate effective purgative must be given, and for this purpose the hypodermic injection of a solution containing from 1 to 1½ grains of Arecoline Hydrobromide has proved to be the most efficacious. Failing the above, a purgative may be given in the form of an electuary, which consists of suitable drugs mixed with treacle or molasses to form a mass that can be pasted on the back of the horse's tongue with a flat stick. Istin (Bayer) 2–4 drachms can be given this way or Aloin 1–2 drachms plus calomel 2 drachms.

As there is usually difficulty in swallowing, drenching must be avoided. This practice results in some of the drench "going down the wrong way" and setting up a fatal mechanical pneumonia.

Following purgation, a suitable stimulant must be given night and morning, and for this purpose it is recommended that 2 drachms of Nux Vomica and 2 drachms of Ammonium Carbonate be mixed with treacle and given as an electuary.

While the animal remains in the sling careful attention must be maintained in regard to general nursing measures. The feed must be easily masticated and laxative; greenstuff and small bran mashes being indicated. Fresh clean water should always be available to the patient.

Under the most favorable conditions some few horses will make a recovery, but they must be kept in the trevis-like sling for many weeks. For the first two weeks at least, it is inadvisable to take the patient out of the sling at all. By that time, if progress has been made, an experiment might be tried by leading the horse out for a short walk. As it is being let out of the trevis one man should take hold of its tail while two others should support each hip. Twenty or thirty yards should be sufficient for the first day. If that exercise is satisfactory, a gradual increase is made in the daily walk, and after perhaps two weeks, or as progress suggests, the patient may be allowed free during the day, but placed in the sling at night until the owner is satisfied that the horse can rise without aid.

A type of sling that proves satisfactory is one constructed with four posts with a stout rail along each side, from which strong sacking supported by straps or ropes can be used for the support of a horse. A breast-plate and breeching of rope completes the sling. This trevis, as it really is, if erected in an open type of shed, allows an arrangement whereby the horse can be conveniently led in and out without backing or turning sharply.

Another type of sling can be improvised by suspending the two rails *via* an endless chain pulley block from a stout tripod or rafter. This can be slackened by day to allow limited exercise and made firm again at night.

Old, damaged fodder should not be fed to stock, and if it cannot be destroyed should be fenced off, as was done in this instance

Control Measures

In discussing botulism, the old maxim, "prevention is better than cure", is particularly apt. If sound fodder only is used and if precautions are taken to prevent contamination by mice or with manure, botulism cases will be unlikely to occur; consequently, it is necessary to take every precaution to protect hay, chaff, and grain from damage by rain or by mice.

Poultry should be kept out of the stables and fodder barns, which latter should also be as nearly as possible mouse-proof.

All straw-roofed stables should be inspected. Those beyond repair should be pulled down. In all cases it would be advisable to line the roof immediately above the mangers with galvanized iron to prevent water and dust from falling.

Damaged hay—tops and bases of stacks—decomposing cocky chaff, and other similar material should be burned, and manure should not be allowed to collect around the stable yard.

Care should be taken to ensure a pure water supply for all stock.

To correct the depraved appetite acquired by many country horses, which is indicated by the dung-eating habit, a mineral supplement should be made available. With horses, calcium (lime), is the essential mineral which is deficient in many Victorian country districts, and the following mixture is recommended for general use:—

Stock salt,	60 parts by weight.
Agricultural lime,	40 parts by weight.

The mixture may be placed in boxes in the stable yard, or may be placed in a small tray alongside each manger. In many cases, a change of diet has a beneficial effect on this depravity. Lucerne chaff or hay is excellent for this purpose.

BOTULISM IN CATTLE

(*Impaction Paralysis.*)

A predisposing factor in the cause of botulism in cattle is the bone-chewing habit, due in almost all cases to the cattle receiving rations deficient in some essential ingredients. Better and more liberal feeding and the provision of licks containing bone-meal or bone flour (calcium phosphate), assist in preventing this habit. This deficiency is also the cause of cattle eating manure, particularly poultry manure.

Symptoms

It is difficult to state what is the first symptom. Several stock-owners have stated that the first they have noticed is a stiffness in the action of the front legs, but it is probable that earlier than this there would be a difficulty in gathering food, together with a general lassitude and drowsiness. Slobbering at the mouth takes place, and sometimes there is a watery discharge from the nose. Rumination or chewing the cud ceases, the paralysed tongue may protrude from the mouth, and the stiffness in the gait increases to an unsteadiness in walking.

There is naturally a falling away in condition, and this is emphasized by the flattening of the usually well-sprung posterior ribs. The breathing is shallow with no movement of the chest wall, but simply shows as a fluttering of the flank muscles.

Soon the beast can neither eat nor drink, or can drink only with difficulty, and finally it goes down, and is unable to rise.

The average case may linger from three to five days, but more acute cases occur, and with such, death may take place in a few hours. The symptoms in these acute cases would be sudden paralysis and coma.

The paralysis most commonly noticed is, of course, that of the muscles of the limbs, but it must be remembered that the muscles used in the acts of gathering food, of swallowing, of stomach and bowel movement, and of breathing are also affected in some degree.

Post-mortem Appearances

Post-mortem appearances vary according to the length of the illness. In acute cases, little abnormality will be noticed in the carcass, but if the beast has been drenched, some evidence of the drench having "gone the wrong way" may be seen by its presence, and perhaps even that of some food, in the wind-pipe and bronchial tubes.

In longer-standing cases in which a drench has not been swallowed correctly, there may be a definite pneumonia evidenced by a portion of the lung being solidified, and by the presence of a frothy septic discharge in the bronchial tubes.

In the average case there invariably is a large amount of food present in the paunch; if the beast had not been able to drink for some days, the condition of this food both in the paunch and in the bible is drier than normal, which condition was one of the factors by which the disease was earlier known as impaction paralysis. This so-called impaction is more correctly termed a stagnation of food, and is due to the paralysis of the muscles of the digestive canal. In many cases a piece of bone has been noticed among the paunch contents. Any decaying food that may have been the cause of death would very likely not be recognized even if still present. Often a bolus of food is seen in the back of the mouth, although it may be positively known that no food has been eaten for many hours, or even days.

In cases that have been drenched early in the illness, but which have died subsequently, the intestine, unlike the stomach compartments, contains very little ingesta.

Treatment

Frequently in cattle a lethal dose of the poison may be swallowed, but on account of the arrangement of the digestive system in ruminants, it is probable that the poison is distributed through the large amount of food held in the paunch, hence full absorption may not take place at once, and if it is possible to remove any unabsorbed poison, the patient may recover.

The first consideration is, therefore, an effective quick-acting purgative. The hypodermic injection of a solution containing 1–2 grains of Arecoline Hydrobromide usually brings about effective purgation in 20 minutes to half an hour. After purgation, the stimulant electuary, mentioned previously, should be pasted on the back of the tongue twice or three times daily, till recovery is assured.

Owing to the paralysis of the pharynx, it is not considered advisable to drench cattle affected with botulism. Where Arecoline Hydrobromide is not available the following drench may be given by means of the stomach tube, or trocar and cannula as described:—

Epsom salts 1–1½ lb.
Nux vomica 2 drachms.
Ammonium carbonate 4 drachms.
Water 1 quart.

Decomposing carcasses lying about a paddock are a menace to stock health, and should be gathered up and burnt.

Puncturing the rumen with a sterilized trocar and cannula for administration of a drench, as described.

(*a*) Stomach Tube.
(*b*) Trocar and Cannula.

(*a*) As an improvised tube 5 feet of ½-inch hose may be used. To insert, first construct a wooden gag to fit as a bit across the mouth; bore a hole in the centre large enough to take the tubing, and with the gag in place, and the cow's head and neck held straight, pass the tube through the hole in the gag, and over the back of the tongue into the gullet. After it enters the gullet it should be possible to feel it there with the hand, manipulating the left side of the neck just above the wind-pipe.

A length of approximately 4 ft. 6 in. of the hose should be inserted, a funnel attached and the drench poured in.

To sustain a patient that is unable to swallow, sloppy and liquid foods such as gruels, hay tea, milk, or molasses, may be given through the stomach tube.

(*b*) A trocar and cannula is inserted into the rumen at the left flank at a point equi-distant from the last rib, the point of the hip, and the edge of the loin bones. The trocar is then withdrawn, and the drench poured in through a funnel. Neither of these operations is as easily performed on the recumbent paralyzed beast as on one not so affected, therefore the services of a veterinarian should be obtained, where possible.

During treatment and convalescence a soft nutritious easily digested diet must be given and a supply of fresh clean water must be kept always available.

Slings are not considered advisable in the treatment of cattle as these animals rest much more comfortably on the ground. While on the ground measures must be taken to prevent stiffness and sores.

Prevention and Control

1. The most important factor in preventing the bone-chewing habit (and therefore, botulism), is in the provision of adequate and properly balanced food supplies throughout the year.

2. All bones and portions of carcasses, including rabbits and birds, should be gathered up and burned or buried. Where bone-chewing is in evidence the following lick should be made available either in the paddock or mixed with the feed where cows are hand-fed.

Common salt 70 to 80 per cent.
Bone meal 30 to 20 per cent.

3. Fodder damaged by mice, by moulds, or by moisture should not be fed to stock nor should stock be allowed access to such fodder. Special care, therefore, is necessary during mouse plague periods and the season of summer and autumn rains.

BOTULISM IN SHEEP

Botulism in sheep was first recognized in Western Australia and the disease in that State assumed such serious proportions that extensive experimental work was carried out which culminated in the elaboration of a highly successful vaccine. In Victoria this disease does not appear to be the serious trouble that it is in Western Australia, but sufficient of it is seen to warrant a description.

Botulism in sheep is the result of ingestion of carrion such as rabbit and fowl carcasses. The reason for this depraved appetite is poor or unbalanced nutrition and hence the disease is generally seen in the summer and autumn. Supplementary balanced feeding will correct the unnatural depravity.

Symptoms

The symptoms of botulism in sheep vary greatly according to the amount of toxin absorbed. In mild cases, a sheep will segregate itself from the remainder of the flock and lie down; it may recover in a few days. In the more acute cases symptoms may occur within the day of consuming

the carrion. These sheep isolate themselves and lie down and if left undisturbed die in from 24 hours upwards. If disturbed and they are able to rise, it will be noticed that they move with an irregular unsteady stiff gait, the head appears to wobble uncontrollably and they run into objects (fences) as if blind. The mortality due to botulism is heavy.

Post-mortem

Post-mortem findings in sheep are in the main, negative. Specific organic change is negligible. The carcass usually shows evidence of malnutrition and portions of the responsible carrion may be found in the paunch.

Treatment

Treatment of affected sheep is not advised, but if desired would consist of an effective purgative followed by stimulants and careful nursing.

Preventive Vaccination

Following experimentation in Western Australia by the Department of Agriculture in that State in conjunction with the Council for Scientific and Industrial Research, a vaccine conferring a high degree of immunity in all animals was evolved. This vaccine is now manufactured commercially by the Commonwealth Serum Laboratories and is available to stock-owners. A single dose of 10 c.c. for horses, 10 c.c. for cattle, and 5 c.c. for sheep, will confer an immunity that is effective about a fortnight after vaccination, and remains so for twelve months.

A second vaccination of similar dose rate about twelve months after the first is recommended to stimulate the immunity which will then probably be effective for the life of the animal.

While granting that vaccination is an effective preventive for the mortality caused by botulism, it is well to remember that this disease is the result of an unbalanced diet or malnutrition and even though the stock be vaccinated, any evidence of a depraved appetite should be counteracted by suitable adjustments to the diet. Whenever the diet is poor or lacking in some vital constituent, the stock will be low in productivity and health generally.

COLIC IN HORSES

Sudden changes in the feed, overfeeding, idleness on a full diet, fatigue, excessive drinking, defective teeth, greedy feeding, and bad feed stuffs, may all result in colic, while exposure to abrupt changes in the weather may predispose horses to the trouble.

All of the abovementioned factors, however, can be avoided by careful management and treatment of horses. An occasional bran mash, say at week-ends, may help to keep the horse in good condition. Green horses must be brought gradually into hard work and full rations. A horse straight from heavy work should be given small drinks only until he has cooled down, then allowed free access to water. Bad teeth do not allow proper mastication of the food, and may induce the onset of colic, hence due attention must regularly be given to the teeth. Greedy feeders and nervous feeders bolt their feed, and may be predisposed to colic.

In colic cases it is advisable to get in touch with a qualified veterinarian. Place the horse in a paddock or roomy stall where he cannot hurt himself.

A useful drench is as follows:—Raw linseed oil, 1 to 1½ pints; oil of turpentine, 2 oz.; aromatic spirits of ammonia, 2 oz.; tincture of nux vomica, 1 oz. This may be followed in two hours time, and then at two-hourly intervals by a second drench as follows:—Aromatic spirits of ammonia, 2 oz.; sweet spirits of nitre, 1 oz.; water, ½ pint.

When drenching, raise the animal's head slightly above the horizontal, using a rope around the jaw only, and allow the tongue complete freedom.

Whatever else is done, nothing should be attempted to make the horse pass its water. Anything of this nature is of the utmost cruelty. When the horse has recovered from the colic, all body functions will return to normal.

[Contributed by the Live Stock Division.]

Final Results

BURNLEY EGG-LAYING COMPETITION, 1945-46

By H. F. CLINTON, *Poultry Expert*

THE thirty-fifth Egg-laying Competition for fowls, conducted at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1945, and concluded on 2nd March, 1946, a period of 48 weeks.

The Single Test Competitions continue to be well supported by breeders, as the whole of the accommodation provided for this competition was filled. The accommodation consisted of 236 pens, each housing one bird.

As was the case in this year's competition, it is pleasing to note that for the 1946–47 competition, which has just commenced, many more applications were received than could be accepted for the accommodation available.

The competition as from 1942–43 has been limited to Individual Birds, Single Test, and there is a great shortage of pens required by competitors.

For the 1946–47 competition, applications were received for a total of 638 birds, and of these 402 birds had to be eliminated by ballot.

The beneficial effect of the competition on the industry as a whole is widely recognized. The introduction to commercial poultry farms of the progeny of birds which have distinguished themselves at Burnley, has greatly improved the quality of Victorian flocks generally, and the size of eggs produced.

This White Leghorn owned by Mr. T. A. Pettigrove laid 280 first-grade eggs, the highest score in this year's competition.

Victorian conditions are well-suited for egg-production, and large numbers of fowls, principally White Leghorns, Australorps, and to some extent, Rhode Island Reds, are kept for this purpose on commercial farms, and also as an adjunct to other branches of farming. Many thousands of birds are kept throughout Victoria, the flocks kept by commercial egg producers varying from 1,000 to 20,000 birds. The importance and high value of the poultry industry of Victoria is well recognized, and large demands are constantly being made in respect to eggs in shell and for table poultry. The prices recently received for eggs have been satisfactory.

Although at the end of the 48 weeks' period of the competition just concluded, no bird has laid a sufficient number of eggs to enable it to qualify for retention for the full twelve months in an attempt to break the present Burnley egg-laying record, many good scores were recorded, and the number of eggs laid by the leading birds were remarkably close to one another.

The Burnley competition was inaugurated in 1911, and the highest twelve months' record for a single bird of any breed since that date was made by an Australorp entered by Mr. F. W. Becker in the 1940–41 competition. This bird laid a total of 340 first-grade eggs in 52 weeks, and 312 in 48 weeks.

In the 48 weeks'-period of the competition just concluded, the best performance was that of a White Leghorn entered in the wet mash class by Mr. T. A. Pettigrove. This bird laid 280 first-grade eggs, the highest score in all classes of the competition. Mr. Pettigrove has been a consistent and successful competitor in the Burnley Competitions almost since the commencement of these competitions in 1911–12.

Several other well-known competitors followed very closely behind that of the best performance, with Australorps and White Leghorns. An

The winning Australorp owned by Mr. H. E. Hill. This bird laid 279 first-grade eggs.

Australorp, owned by Mr. H. E. Hill, laid 279 first-grade eggs, and a White Leghorn, entered by Mr. K. C. McKenzie in the dry-mash class, laid 278 first-grade eggs, only one and two eggs less respectively than the number laid by Mr. Pettigrove's bird.

A White Wyandotte entered by Mr. D. Granter, laid 221 first-grade eggs, and a Langshan entered by Mr. J. W. Hattwell, 220. A very good performance was recorded by a Rhode Island Red, owned by Mr. J. W. Hattwell, which laid 269 eggs, all first-grade.

Rhode Island Reds were represented by 28 birds.

As a result of the ballot many well-known breeders were prevented from competing.

The mortality among the competing birds was 10·2 per cent., which is higher than usual. As it is in the interest of all poultry breeders to improve their flocks and reduce mortality, competitors should exercise special care in the selection of the stock used to produce birds for egg-laying competitions, and breed only from those possessing a high degree of constitutional vigour.

In the competition, prize certificates and sashes were awarded the owners of birds laying the greatest number of first-grade eggs. During the first two months of the competition a first grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz. At Burnley, every egg is weighed to one-tenth of an ounce. The records are available for examination by any competitor.

The Awards

Single Test.

In the class for White Leghorns fed on wet mash, first prize was won by Mr. T. A. Pettigrove, and this competitor was also awarded the Burnley Champion Sash for his bird, which laid 280 first-grade eggs, the highest score in all classes of the competition. Mr. O. Scott gained second prize with a bird that laid 274 eggs, and Messrs. A. Martin and O. Scott were equal for third prize, each of their birds having laid 273 eggs.

In the White Leghorn class, fed on dry mash, first prize was won by a bird entered by Mr. K. C. McKenzie. This competitor was also awarded the third prize Burnley Sash, for a bird that laid 278 first-grade eggs. Second prize was awarded to Mr. J. Rasmussen, whose bird laid 275 eggs, and the Goulburn Valley Stud (J. E. Coupar), winner in this class last year, was third with 273 eggs.

In the class for Australorps, Mr. H. E. Hill's bird won first prize. This competitor was also awarded second prize Burnley Sash, for a bird that laid 279 first-grade eggs. Mr. E. J. Ikin's bird gained him second prize with a total of 276

Mrs. K. C. McKenzie's White Leghorn, winner of Class 2, Dry Mash Section, with a total of 278 first-grade eggs.

White Wynadotte, owned by Mr. D. Granter, won first-place in Class 5 with a total of 221 first-grade eggs.

eggs, and a bird entered by Mr. W. Yates was third with 266 eggs.

In the class for all Heavy Breeds other than Australorps and Rhode Island Reds, Mr. D. Granter, winner with a White Wyandotte in this class last year, again won first prize with a bird of the same breed that laid 221 first-grade eggs. Mr. J. W. Hattwell obtained second prize with a Langshan—220 eggs.

In the class for Rhode Island Reds, Mr. J. W. Hattwell was awarded first prize. This competitor's bird laid a total of 269 eggs, all first-grade. Mr. H. L. Chalmers' bird obtained second prize with 256 eggs, and Mr. F. G. Fereday's bird was awarded third prize with 245 eggs.

Average Egg Production

There were 236 fowls in the competition at its commencement, but 24 died. The total number of days these latter birds collectively were in the pens was 4,304, which is equal to approximately thirteen birds having been there for the full 48 weeks. Therefore, the total number of birds in the competition for the whole period may be regarded as 225, and this is the figure used in working out the averages.

The total number of eggs laid, including those underweight, was 47,738, an average per bird of 212·1 for the 48 weeks.

The price realized for the eggs averaged a fraction over 1s. 8¾d. per dozen. The market value of the eggs averaged £1 10s. 1¾d. per bird.

The prices received for the eggs, however, are the net prices exclusive of freight or commission charges, &c. Also it must be remembered that the eggs were laid by pullets in their first period of production, under conditions entirely different from those on commercial farms, where birds of various ages are kept in large flocks.

Appointment of Mr. W. E. Macauley

During the course of the competition, Mr. W. E. Macauley was appointed Curator-in-Charge of the Burnley Egg-laying Competition in succession to his father, Mr. J. Macauley, recently retired, and who had carried on the position of Curator for more than 30 years. Mr. Macauley, jun., assisted his father at the competitions for many years, and later was appointed Assistant Poultry Expert.

STATEMENT SHOWING THE NUMBER OF EGGS LAID BY THE VARIOUS BREEDS IN THE COMPETITION, AND THE AVERAGE NUMBER OF EGGS LAID PER BIRD.

Breeds.	Number of Birds After Allowing for Deaths	Eggs Laid.			Average Number of Eggs Laid per Bird.		
		First Grade.	Under-weights.	Total.	First Grade.	Under-weights.	Total.
LIGHT BREEDS—WET MASH—							
White Leghorns	82	17,099	966	18,065	208·5	11·8	220·3
OTHER LIGHT BREEDS—WET MASH	7	1,050	72	1,122	150·0	10·3	160·3
LIGHT BREEDS—DRY MASH	49	10,293	470	10,763	210·1	9·6	219·6
TOTAL LIGHT BREEDS—WET AND DRY MASH ..	138	28,442	1,508	29,950	206·1	10·9	217·0
HEAVY BREEDS—WET MASH—							
Australorps	51	10,013	697	10,710	196·3	13·6	210·0
Rhode Island Reds	25	4,922	246	5,168	196·9	9·8	206·7
Other Breeds	11	1,868	42	1,910	169·8	3·8	173·6
TOTAL HEAVY BREEDS	87	16,803	985	17,788	193·1	11·3	204·4
TOTAL ALL BREEDS	225	45,245	2,493	47,738	201·1	11·1	212·1

TABLE OF MONTHLY LAYING RETURNS 1945-46.

Month.	Light Breeds.						Heavy Breeds.					
	White Leghorns.			Other Light Breeds.			Australorps.			Other Heavy Breeds.		
	Average No. of Birds.	Total.	Average.	Average No. of Birds.	Total	Average.	Average No. of Birds.	Total	Average.	Average No. of Birds.	Total.	Average.
April	134	1,964	14·5	8	29	3·6	54	865	16·0	40	542	13·5
May	134	2,258	16·8	8	22	2·7	53	1,171	22·0	39	601	15·4
June	134	2,223	14·9	8	20	2·5	53	1,115	21·0	38	602	15·8
July	133	2,274	17·0	7	55	7·8	53	1,018	19·2	37	603	16·2
August	133	2,839	21·3	7	127	18·1	52	1,124	21·2	37	714	19·2
September	132	3,129	23·5	7	161	23·0	52	1,130	21·7	36	776	21·5
October	131	3,283	25·0	7	171	24·4	51	1,078	21·1	36	815	22·6
November	129	2,999	23·2	7	142	20·2	50	930	18·6	35	705	20·1
December	126	2,767	21·9	7	137	19·5	48	825	17·1	35	625	17·8
January	126	2,722	21·6	7	133	19·0	48	765	15·9	35	551	15·7
February and March 1–2	123	2,370	19·2	7	125	17·8	47	689	14·6	35	544	15·5

PRIZE LIST—1945-46

SINGLE TEST.

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate, also Burnley Champion Sash.			
164	T. A. Pettigrove, 159 Hawdon-street, Heidelberg. N.22	284	4	280
	Second Prize—Government Certificate.			
173	O. Scott, Fawkner-street, Broadmeadows	275	1	274
	Equal Third Prize—Government Certificate.			
145	A. Martin, 23 Clonaig-street, North Brighton, S.6	273	..	273
174	O. Scott, Fawkner-street, Broadmeadows	273	..	273
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate, also Third Prize—Burnley Sash.			
204	K. C. McKenzie, 82 Clarence-street, Geelong West	279	1	278
	Second Prize—Government Certificate.			
227	J. Rasmussen, Moorabbin-road, Cheltenham, S.22	275	..	275
	Third Prize—Government Certificate.			
197	Goulburn Valley Stud (J. E. Coupar), Box 18, Nathalia	273	..	273
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate, also Second Prize—Burnley Sash.			
24	H. E. Hill, 21 Turner-street, North Wonthaggi	281	2	279
	Second Prize—Government Certificate.			
25	E. J. Ikin, 44 MacKay-street, Seddon, W.13	285	9	276
	Third Prize—Government Certificate.			
54	W. Yates, 64 Bank-street, East, Ascot Vale, W.2	266	..	266
	Class 5.— All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
65	Don Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	223	2	221
	Second Prize—Government Certificate.			
59	J. W. Hattwell, Springvale-road, Glen Waverley (Langshan)	220	..	220
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
79	J. W. Hattwell, Springvale-road, Glen Waverley	269	..	269
	Second Prize—Government Certificate.			
71	H. L. Chalmers, 9 Lefevre-street, Spotswood, W.14	270	14	256
	Third Prize—Government Certificate.			
74	F. G. Fereday, 4 Ross-street, Northcote, N.16	248	3	245

FIRST CLASS CERTIFICATES OF MERIT TO HENS IN CLASSES 1, 2, AND 4 WHICH LAID 240 FIRST GRADE EGGS, AND IN CLASSES 3 AND 5 WHICH LAID 220 FIRST GRADE EGGS.

Pen No.	Name and Address.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.	
131	H. E. Hill, 21 Turner-street, North Wonthaggi	271
149	T. A. Mentiplay, Somerville	265
181	N. E. Taylor, and Son Burwood-road, Vermont	264
104	L. Abikhair, 41 Wilfred-road, Ivanhoe, N.21	262
106	J. Armstrong, 657 Bell-street, West Preston, N.18	261
182	N. E. Taylor, and Son Burwood-road, Vermont	261
169	J. M. Robertson, Princes-street, Ararat ..	256
108	H. Baberton, Albert-street, Highett, S.21	255
178	J. A. H. Smith, 3 Bowen-street, Horsham	255
111	F. A. Brennan, 97 Reese-street, Sale ..	254
153	B. J. Neenan, 19 Carween-avenue, Mitcham	254
109	F. W. Becker, Follett-road, Cheltenham, S.22	252
125	J. J. Hawks, 362 Barkly-street, Ararat ..	251
159	Mrs. H. F. Pearse, Box 33, Donald ..	244
137	H. Lyon, 33 Clara-street, Preston, N.18 ..	243
134	C. and K. Langdon, Bullock Swamp, via Colac	242
112	F. A. Brennan, 97 Reese-street, Sale ..	240
	Class 2.—White Leghorns—Dry Mash	
222	Miss E. Milligan, State School No. 3732, Ballendella, via Rochester	271
218	Mayfield Poultry Farm (E. B. Frith), 54 Cromer-road, Beaumaris, S.10	266
189	F. W. Becker, Follett-road, Cheltenham, S.22	258
231	J. T. Simmons, 6 Lindsay-avenue, Murrumbeena, S.E.9	253
193	W. J. Cooke, 91 Hopetoun-avenue, West Brunswick	250
209	G. McDonnell, 46 Childers-street, Kew, E.4	247
216	A. Martin, 23 Clonaig-street, North Brighton, S.6	247
220	Milledge Bros., 24 McKinley-street, Echuca East	247
196	G. C. Fereday, 4 Ross-street, Northcote, N.16	244
	Class 4.—Australorps—Wet Mash.	
51	R. Waugh, Lockwood-road, Kangaroo Flat	265
36	C. S. G. Nettlebeck, "Edenhope," Westall-road, Springvale	264
21	E. A. Head, 38 Serrell-street, East Malvern, S.E.5	263
52	R. Waugh, Lockwood-road, Kangaroo Flat	263
28	Marywood Poultry Farm (A. J. Waugh), Helms-road, Kangaroo Flat	262
34	Napier Poultry Farm (R. A. Murdock) Peg Leg-road, Eaglehawk	260

Pen No.	Name and Address.	First Grade Eggs.
	Class 4—Australorps—Wet Mash—*continued*.	
39	Mrs. H. F. Pearse, Box 33, Donald ..	259
5	A. and L. Caspar, Main-street, Bacchus Marsh	258
35	C. S. G. Nettlebeck, "Edenhope," Westall-road, Springvale	258
18	C. E. Graham, Portarlington	253
1	F. W. Becker, Follett-road, Cheltenham, S.22	242
17	C. E. Graham, Portarlington	242
53	W. Yates, 64 Bank-street East, Ascot Vale, W.2	242
	Class 5.—Rhode Island Reds—Wet Mash.	
90	J. Robertson, jun., 40 Ardmillan-road, Moonee Ponds, W.4	234
88	A. M. F. Robertson, "Eston," 70 Somerville-road, Yarraville	226
78	F. A. Hardie, Parker-avenue, Boronia ..	221

Winner of class 5, Rhode Island Reds. This bird, owned by J. W. Hatwell, laid 269 first-grade eggs.

Seed Potato Certification

List of Growers, 1946

By G. H. MATTINGLEY,
Potato Expert

A LIST of growers of seed potatoes, whose crops have been inspected at least twice in the field and conform to the standard of purity and freedom from disease required under the Seed Potato Certification Scheme, is appended. The produce of these crops may be sold as "Certified" seed provided the tubers comply with the Grade Standard for seed potatoes and are contained in sealed bags bearing an official label. Sales of certified seed potatoes may be made by direct negotiation between buyer and seller, subject to a Potato Sales Permit obtainable from any Potato Inspector or the Deputy Potato Controller, 370 Little Collins-street, Melbourne.

LIST OF GROWERS OF PROVISIONALLY CERTIFIED SEED POTATOES, 1946.

Name.	Address.	Acres.
EARLY CARMAN.		
Allan, J. M. and R.	Whelan's L.B., via Leongatha	13
Campbell, D. S. and H. D.	McKinnon's P.O., via Leongatha	3
Chalmers, D. M., jun.	Leongatha	5
Collery, Jas.	Kerrie, via Romsey	10
Collery, John	Hesket, via Woodend	9
Coulter, E. and W. L.	McKinnon's P.O., via Leongatha	7
Coulter, N. K.	Nichol's-road, Leongatha	10
Crozier, G. S.	Newham, via Woodend	6
Gilbert, H. T.	Amey's Track, Foster	6
Gunn, N.	Thorpdale	2
Launer, G. F.	Beech Forest	½
Mayall, R. H.	Nichol's-road, Leongatha	15
Miller, G. L.	Amey's Track, Foster	3
Morter, H.	Leongatha	5
McBeth, J.	Neerim-road, Carnegie	7
McGrath, W. J.	Stony Creek	5
McIndoe, R. E.	Leongatha	15
Powell, H. and Sons	Thorpdale	23
Steele and Young	McKinnon's, via Leongatha	5
White, John	"Elnaam," Neerim	4
Wilson, I. W.	Neerim Junction	7
LATE CARMAN.		
Barker, L. G.	Weeaproinah	7
Beattie, M.	Krambruk North	2
Benson Bros.	McDevitt	6
Bowen, C. E.	Kennedy's Creek, via Gellibrand	½
Brown Bros.	Wyelangta	15
Brown, D. B.	Wyelangta	4½
Butler, J.	Weeaproinah	5
Cole and Weston	Beech Forest	8
Collery, Jas.	Kerrie, via Romsey	6
Collery, John	Hesket, via Woodend	2
Congram, W. J. P.	Beech Forest	4
Crozier, G. S.	Newham, via Woodend	11
Curry, M. J.	Kinglake	4
Dyball, A. H.	Toolangi-road, Kinglake	7
Easdown Bros.	Kinglake Central	17
Ebbels, J. T.	Olinda	20
Else, J. F.	Romsey	19
Exton, Arnold	Pheasant Creek, via Whittlesea	8
Exton, A. P.	Pheasant Creek, via Whittlesea	4
*Exton, Chas. and Sons	Kinglake Central	12
Fincher, R. L.	Beech Forest	3
Francis, J. E.	Ferguson	12
Fry, J. G.	Beech Forest	2
Gardner, G. J.	Beech Forest	9
Gray, J. R.	Beech Forest	6

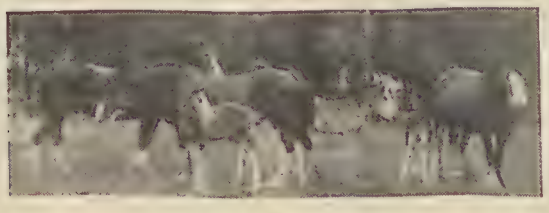
Name.	Address.	Acres.
LATE CARMAN—*continued.*		
Grosse, H. G.	Beech Forest	5
*Hansen, H. T.	Ferguson	2
Hawkins, E. T.	Kinglake	19½
Hobson, J. T. and Son	Laver's Hill	6
Jeffery, E. E.	Toolangi	4
Jenkins Bros.	Kinglake West	7
Johnson, J. L.	Wyelangta	5½
†Knox, J. and Son	Weeaproinah	4
Lawrey, L. K.	Kinglake Central	20
Lee, J. A.	Laver's Hill	2
Meehan, B. P.	Webster's Hill, via Beech Forest	5
Minchinton Bros.	Ferguson	4
*Minchinton, E. A.	Weeaproinah	3
Minchinton, F. J.	Ferguson	13
Morrow and Joiner	Beech Forest	9
Murchison, A. M. J.	Ferguson	15
McBeth, J.	Neerim-road, Carnegie	8
McMahon, Jas. P.	Kinglake	8½
O'Brien Bros.	Weeaproinah	7
Owen, F. J. and Sons	Pheasant Creek, via Whittlesea	25
Parker, S.	Ferguson	7½
*Pearce, A. E.	Webster's Hill, Beech Forest	2
Power, E.	Kinglake Central	1
Pretty, A.	Kinglake Central	1
*Reeves, S.	Kinglake	2
*Russell, E. J.	Tanybryn, via Colac	2
Schmidt, R. L.	Beech Forest	1½
Schultz, A. and Son	Beech Forest	4
Simmons, G. J.	Wyelangta	4½
Simmons, J. C.	Wyelangta	2
Simpson, M. H.	Pheasant Creek, via Whittlesea	5
Skinner, F. T.	Ferguson	10
Symonds and Ricardo	Hoddle's Creek	40
Tann, W. H.	Weeaproinah	23
Tibbitts Bros.	Wyelangta	2
Toohey, D. J.	Pheasant Creek, via Whittlesea	20
Toohey, J.	Pheasant Creek, via Whittlesea	25
Toohey, L. F.	Kinglake	30
Toohey, T. J.	Kinglake	20
Towers, A. J.	Beech Forest	12
Townsend, J. O. A.	Ferguson	4½
Webster, S.	Laver's Hill	3
White, John	"Elnaam," Neerim	6
Wilson, I. W.	Neerim Junction	4½
Wood, R.	Kinglake Central	6
Yelverton, L. J.	P.B., Tatong	13
Young, A. E.	Beech Forest	12
Young, R. and A.	Weeaproinah	5½
Zappelli, S.	Beech Forest	3

† No seed for sale. * For own use only.

List of Growers of Provisionally Certified Seed Potatoes, 1946—*continued.*

Name.	Address.	Acres.
KATAHDIN.		
Butler, J.	Weeaproinah	¼
Chapman, W. W. ..	Gordon	6
Collery, Jas. ..	Kerrie, via Romsey ..	3
Collery, John ..	Hesket, via Woodend ..	3
Dyer, M. H. ..	Gembrook	7
*Exton, Chas. and Sons	Kinglake Central	½
Foran, H. J. ..	Waubra	22
Giles, A. W. and Son ..	Koo-wee-rup	7
Grosse, H. G. ..	Beech Forest	1½
Hall, E. J.	Cobaw, via Woodend ..	¼
Hawkins, E. T. ..	Kinglake	¼
†Knox, J. and Son ..	Weeaproinah	4
Launer, G. F. ..	Beech Forest	1½
McBeth, J... ..	Neerim-road, Carnegie ..	1
Wilson, I. W. ..	Neerim Junction	1½
SEBAGO.		
Barker, L. G. ..	Weeaproinah	¼
*Baulch, G. R. and R. M.	Wyelangta	3½
Boustead, A. C. ..	Dean	4½
Brown, D. B. ..	Wyelangta	1½
Butler, J.	Weeaproinah	1
Chapman, W. W. ..	Gordon	20
Collery, Jas. ..	Kerrie, via Romsey ..	1
Collery, John ..	Hesket, via Woodend ..	1
Deppeler, Bros ..	Beech Forest	2
*Farr, N. E. ..	Wimba	1
Foran, H. J. ..	Waubra	5
Gardner, R. W. ..	Beech Forest	1
Giles, A. W. and Son ..	Koo-wee-rup	19
Gray, J. R.	Beech Forest	5
Grosse, H. G. ..	Beech Forest	16
*Grove, G. A. and F. W.	Olangolah East, via Beech Forest	2
Gunn, N.	Thorpdale	5
Hall, E. J.	Cobaw, via Woodend ..	1
Hawkins, E. T. ..	Kinglake	¼
Heffernan, C. ..	Chapple Vale	2
Hinchcliffe, G. M. ..	Thorpdale	4
Hobson, J. T. and Son	Laver's Hill	1
†Knox, J. and Son ..	Weeaproinah	12
Labbett Bros. ..	Clarke's Hill, via Ballarat ..	7
*Lee, J. A.	Laver's Hill	¼
Lewis, S. J.	Seville	1½
Macrae, E. and J. ..	Narracan East	8
McBeth, J.	Neerim-road, Carnegie ..	16
O'Brien Bros ..	Weeaproinah	5
Pearson, H. and J. ..	Dumbalk, via Meeniyan ..	¼
Pyle, H. A.	Dumbalk, via Meeniyan ..	1
Shackleton, H. ..	Thorpdale	3
Shillito, F. W. ..	Yendon	4
Tann, W. H. ..	Weeaproinah	4
Webster, S.	Laver's Hill	1
*Westbury, R. ..	Wyelangta	¼
UP-TO-DATE.		
Amey and Wisewould	Jindivick	1½
Beattie, H.	Krambruk North	2
Benson Bros. ..	McDevitt	3
Bowen, C. E. ..	Kennedy's Creek, via Gellibrand	1
Brown Bros. ..	Wyelangta	7
Brown, D. B. ..	Wyelangta	5
Butler, J.	Weeaproinah	4½
*Cashin Bros. ..	Ferguson	1½
Cole and Weston ..	Beech Forest	3
Congram, W. J. P. ..	Beech Forest	14
Deppeler, Bros ..	Beech Forest	22
*Fincher, R. L. ..	Beech Forest	1
*Gilbert, H. T. ..	Amey's Track, Foster ..	4
Johnson, J. L. ..	Wyelangta	5
†Knox, J. and Son ..	Weeaproinah	5
*Lee, J. A.	Laver's Hill	1
Miller, G. L. ..	Amey's Track, Foster ..	½
*Minchinton, E. A. ..	Weeaproinah	2
McBeth, J.	Neerim-road, Carnegie ..	5
McMinn, H. G. ..	Wyelangta	6
Perry, J. A.	Beech Forest	10
Russell, E. J. ..	Tanybryn, via Colac ..	1½
Schultz, A. and Son ..	Beech Forest	2
*Simmons, J. C. ..	Wyelangta	3
Smith, J. and Son ..	Stalker	4
Tann, W. H. ..	Weeaproinah	4½
Thomas, G. C. ..	Barramunga	2
Tibbitts Bros. ..	Wyelangta	4
Webster, S.	Laver's Hill	6
SNOWFLAKE.		
Boadle, L. H. ..	Claretown	4
Boustead, A. C. ..	Dean	16
Clements, C. E. ..	Hesket, via Woodend ..	14
Collery, Jas. ..	Kerrie, via Romsey ..	7
Collery, John ..	Hesket, via Woodend ..	6
Gooch Bros. ..	Wheatsheaf	40
Labbett Bros. ..	Clarke's Hill, via Ballarat ..	33½
McBeth, J.	Neerim-road, Carnegie ..	11
Rothe, F. M. ..	Little Hampton, via Trentham	14
Toomey, E.	Trentham	28
White, John ..	"Elnaam," Neerim ..	2

† No seed for sale. * For own use only.



The KEEPING of GOATS

By

A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

IN the English-speaking countries milk production is obtained chiefly from cows, but in many other countries milk goats and milk sheep approach the dairy cow in importance as a milk producer. In Victoria goats are kept by some families for producing milk, and by others for controlling blackberries and producing mohair. It was estimated in 1936 that there were 189,000,000 goats throughout the world at that time. Of this number 8,000,000 were Angoras.

Goat Flesh

Goat flesh is not eaten in Australia to any extent, but in some countries it is an important source of meat, being eaten in considerable quantities in the United States. Goat flesh is difficult to distinguish from mutton and lamb. Goats and kids may be slaughtered and the flesh sold for human consumption under the same regulations as apply to the slaughter of sheep and lambs, and to the sale of mutton and lamb.

Goat Skins

Goat skins make a better leather than do sheep skins and in 1942–43, some 926,000 goat skins were processed for leather in Australia. Most of these skins were imported, although 27,000 were obtained in New South Wales. The leather made from these local skins was valued at £12,000. Goat skins are converted into Morocco leather, which is used in the manufacture of furniture, handbags, boxing gloves, and sporting bags. The skins are also used for making kid leather, which is used in better quality kid gloves and glacé kid shoes. Goat skins bring from 2s. to 3s. each.

Milk

Goats are especially valuable for producing milk for children who are allergic to cows' milk. The goat rarely suffers from tuberculosis. Butter and cheese can be made from goats' milk. The milk and by-products, such as cream, butter and cheese are white.

The fat globules of goats' milk are small and do not rise to the surface when the milk is set but the cream can be taken out satisfactorily in an ordinary separator. When the milk is scalded, the cream will rise and can be skimmed off. The smaller fat globules and the softer curd make goats' milk easier to digest than cows' milk.

A comparison of the composition of milk from two common breeds of cattle and of goats is given in the United States Department of Agriculture Year Book for 1937, in the following table :—

Source of Milk.	Water.	Total Solids.	Fat.	Protein.	Lactose.	Ash.
	%	%	%	%	%	%
*Goat ..	88·02	11·98	3·50	3·13	4·55	·80
Friesian ..	87·50	12·50	3·55	3·42	4·86	·68
Jersey ..	85·31	14·69	5·18	3·86	4·94	·70

* Average of pure-bred and high grade Saanen and Toggenburg does.

"Branxholme Jess", a Saanen goat, gives nearly seven quarts of milk daily.

Breeds of Goats

There are two distinct types of goats—the milk goats and the mohair or meat-producing goats. Amongst the milk goats are the Saanen, Toggenburg, British Alpine, and Nubian, while the Angora is the principal mohair-producing breed. With the exception of the pure-bred Saanen goats, most milk goats kept in Victoria are grades, and are usually descended from several breeds including the Angora. Crossing with the Angora usually reduces milk production, but some of the grades milk very well. There are some good herds of Saanen goats in Victoria, New South Wales, Queensland, and other States, and members of The Goat Society of Australia, which has its headquarters at Endeavour House, 33 Macquarie Place, Sydney, are at present concentrating on the improvement of this breed. There are about thirty Victorian members of this Society and a Victorian Branch is being established in conjunction with the Royal Agricultural Society of Victoria, 422 Collins-street, Melbourne.

The Victorian Angora goats are generally better bred than the average house goat, but the number of enthusiastic breeders is insufficient to encourage the desirable competition.

Mohair

Angoras produce about 5 lb. of mohair annually on country where sheep do poorly, if at all, and where paddocks are heavily overstocked with them to destroy the blackberries. Mohair sells at an average price of 17d. per lb., but as so little of it is available, a local competitive market has not been established. Good markets have been established in the United States of America, Turkey and in South Africa where most of the Angora goats are kept.

The mohair is scoured, combed and treated in much the same way as wool to make such high quality lustrous materials as Astrakhan coats, ladies' top coats, linings for suits and costumes, proscenium curtains used in theatres, ties, and upholstery fabric (mohair velvet) which has a pile which does not flatten. The coarser quality material is used for making mats. Mohair is stronger and more lustrous than wool. It is valued for its length, fineness, tensile strength, and spinning qualities. Its lack of felting qualities makes it a very valuable fibre for certain purposes. The fibres vary in diameter as do wool fibres and the following are the ranges of counts of different samples: coarse mohair 36s., medium mohair 46s., and fine mohair 60s.

A well-constructed goat house on a Montrose farm.

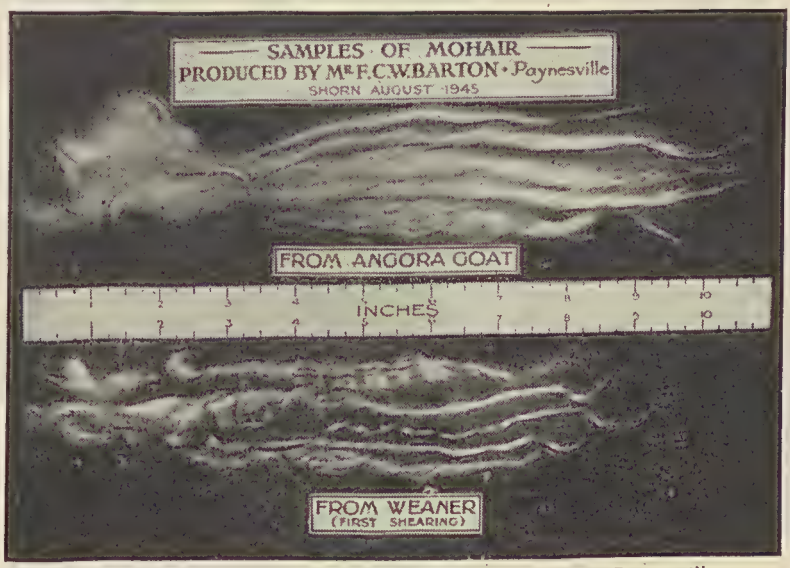
Herds of goats such as this were a common sight on the goldfields in the early days.

Pound for pound mohair usually brings about 2d. more than wool of similar quality and fibre diameter. Although some of the small quantity of mohair produced here is exported from time to time, considerable quantities are imported by fabric manufacturers to mix with wool to make the above-mentioned materials. Usually the desired lustrous finish can be obtained by using about 25 per cent. of mohair in the fabric. In 1942, 4,500,000 Angora goats were shorn in the United States to produce 20,730,000 lb. of mohair. About the same year, 3,000,000 Angoras were shorn in Turkey and 1,500,000 in South Africa. Much of the mohair produced in these last-named countries was exported to England. The number of Angora goats is increasing in the United States which country is also a large importer of mohair. The milk goats are short-haired and do not produce a fleece.

Weed Control

Goats eat a greater variety of herbage than most animals and as they are very hardy they can be used to control blackberries by over-stocking blackberry infested paddocks, but if milk goats are kept under such conditions they cannot be expected to give much milk.

In the United States and South Africa, Angora goats have been used to "tame" country which was originally not suitable for grazing sheep, but after the shrubs had been destroyed and grasses established, sheep have frequently replaced the goats.



Samples of Mohair produced by Mr. F. C. W. Barton, Paynesville

Some farmers on irrigated orchard and vegetable blocks use goats to keep the channels clean. A goat is tethered to a wire stretched between two posts along the channel. When the goat has grazed all the weed growth along that stretch, it is tethered to another stretch and in that way the ditch is kept open and no laborious work is required to cut the weeds or dig them out and force the water along blocked and overflowing channels. Where goats are kept for purposes other than milk production, such as weed control and company for other stock, the Angora is the best breed to use, as these animals produce 8s. to 10s. worth of mohair per head annually and are better meat producers than other breeds.

Control of Goats

Goats themselves are hard to control and for this reason they should be kept in securely-fenced paddocks or tethered. Owners realise the need for keeping their animals secure as, when loose, they usually make for the garden where they will do a tremendous amount of damage in a very short time. Municipal councils are empowered to make by-laws under the *Local Government Act* requiring keepers of goats to register their names and addresses with the Council and have these particulars marked on collars placed around the goats' necks. The Councils may seize goats which are at large, impound them and, if they are not claimed by the owners within two days, destroy them. Goats which are seized without collars bearing the names and addresses of their owners may be destroyed after noon of the day following seizure.

Under Section 15 of the *Pounds Act*, occupiers or Crown Land Bailiffs may destroy goats (and pigs or geese) which trespass into properties rightly under their control. The owners of the goats have the right to claim the carcass within twelve hours, but if not claimed, the persons destroying them shall cause the carcasses to be buried.

Tethering

A strong dog collar and a light plough chain with a good swivel are quite suitable for tethering goats. The name and address of the owner should be shown on the collar.

Many billy goats are castrated and sold to dairyfarmers who run them with the dairy cows to "frighten away disease germs," "to show the cows where the grass is," and so on. While this superstitious practice does not help the dairy farmer, it does provide an outlet for unwanted males. However, in very rugged parts of Europe and Asia, a goat is frequently run with sheep and other stock to lead them along precipitous passes.

Long Life and Maturity

Goats are long-lived and individuals may be expected to reach twelve to fifteen years of age. They reach maturity at about six months of age, but, as in the case of sheep, it is usual not to breed from them until they are about twelve months old. It is found that does freshening for the second time at two years old have produced more milk than does freshening for the first time at the same age.

Well-housed Saanen goats on Mrs. H. Gration's farm 'Strathmore", Heidelberg.

Milk Goats

As with some cows, some milk goats which are well looked after can be bred all the year round, but generally the goat is a seasonal breeder. In the United States it has been found that oestrous occurs regularly through the late summer, autumn and winter, and irregularly, if at all, through the spring and early summer. The doe (female or nanny) comes in season every three weeks and remains on for about three days which allows ample time to mate her. The doe indicates when she is in season

These kids, eight days old, enjoy their play box.

Feeding

Goats should be grazed as much as possible either on a tether or in a securely-fenced paddock to reduce the cost of feeding. A good goat should produce up to one gallon of milk daily on good grazing, but when the grazing fails the goat should be fed some high-quality chaff and concentrates in order to maintain the milk supply. In the winter with green pickings a goat should be given up to two pounds of hay or chaff and two to four pounds of concentrates such as bran, pollard, oats, and linseed meal daily. These feeds are best fed dry. More feed should be offered if the goat is losing condition.

by abnormal excitement, restlessness and petulant bleating. The average gestation period is about 150 days. It is possible for some does to kid twice in the year, but larger milk yields are obtained if kidding is spaced at nine to twelve-month intervals.

Angoras are usually bred once a year and these usually have one kid only, whereas the milk goats which are better cared for may have up to three kids and occasionally more.

Where only one or two goats are kept, it is desirable to make sure that there is a well-bred buck in the district to avoid the expense of keeping one. They should be taught to lead so that they can be led to wherever it is necessary to take them. Where two goats are kept one should be in full milk while the other is dry and so on. A reasonably good goat should produce at least two quarts of milk daily. Yields of one gallon per day are not uncommon on good feed, some does even producing six quarts a day. At Rockhampton, London, a Saanen goat recently produced 4,974 lb. of milk in a year of official recording, making a new record for the breed. Saanens are noted for persistent production and if the does are mated only every second year, they usually milk well for the two-year period.

Goats are accustomed to foraging small shrubs which grow well above the ground and are not normally contaminated with droppings. When intensively grazed on pasture which becomes contaminated quickly, goats are apt to become unthrifty due to infection with worms, to which they appear to be susceptible.

Water

Goats require clean drinking water. Good and consistent milk yields are dependent upon ample supplies of water. If water cannot be made available all the time as may occur when tethering, it should be provided at least twice daily.

A good type of Saanen buck.

The Kids

Best milk yields are obtained when the goat is separated from her kid (or kids) all the time and is milked twice a day. When this is done the kids have to be hand-reared. In some cases the house goat is allowed to rear her own kids which are locked away and then left with her after the house milk has been drawn off. Some goats do not let their milk down freely under this system, but the owner is not tied to the twice-a-day milking and the kids do very well.

At first, the hand-reared kid should be fed four or five times daily, according to size, with one to two ounces of fresh warm milk. As the kid grows, more milk should be given until it is receiving one pint per day at two weeks old, and for convenience the number of feeds per day can be reduced. Kids learn to drink quickly and, after fingering for a day or two, they will usually drink from a basin or bucket. Just as with calves, strict cleanliness of all utensils and fresh milk at body temperature (95–100° F.), are essential. After the kids are one month old they may be fed on skim milk. They should also have access to clean drinking water and to clean pasture as they commence eating solid food at a few days old. They also require warm dry shelter for protection at night and on cold, wet days.

Dehorning

Goats become very tame and like petting, but, to avoid accidents, young children should not be allowed to play with them. All milk goats should be dehorned. The growth of horns can be prevented by destroying the horn buds with caustic potash when the kid is a few days old. The horns of adult goats can be cut off. In both cases the operations are similar to those carried out on cattle.

Horns can be cut off with dehorning cutters or large bolt cutters or sawn off with a fine-tooth saw without causing the animals much inconvenience, but dehorning is best done as a kid two or three days old by clipping the hair from above the horn bud, very slightly moistening the horn bud and then painting it with a stick of caustic potash until beads of moisture are noticed exuding from the whole of the area. The kid may then be turned out. Care should be taken not to dehorn kids by this method in wet weather, unless they are kept under cover, otherwise the caustic will be washed down the face and damage the skin, hair and possibly the eyes. The caustic potash is very corrosive and the operator should take care not to allow it to come in contact with either his skin or clothing. When dehorning by this method has been carried out, it is impossible to distinguish goats which have been dehorned from naturally hornless animals.

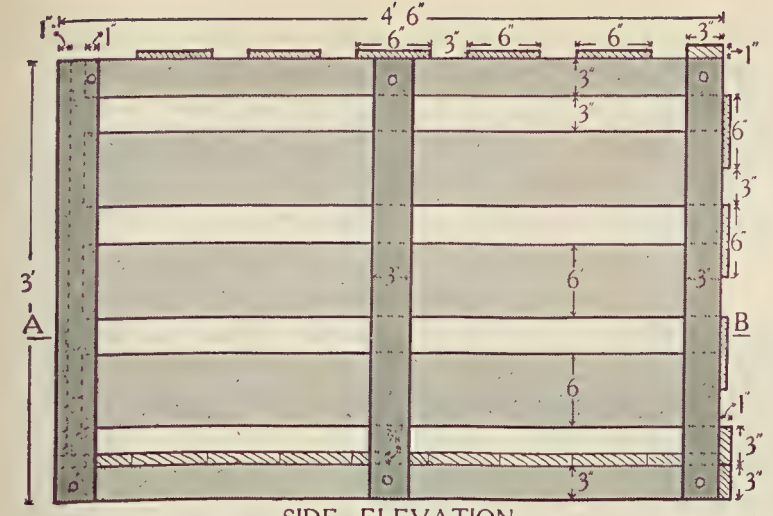
Angora goats are normally horned, but there are polled strains of the principal milk breeds. At present only polled bucks may be registered with The Goat Society of Australia.

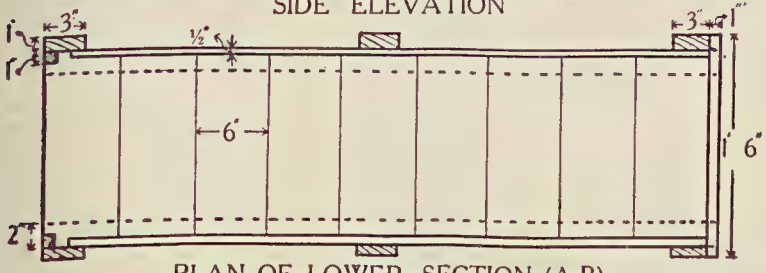
Tattooing

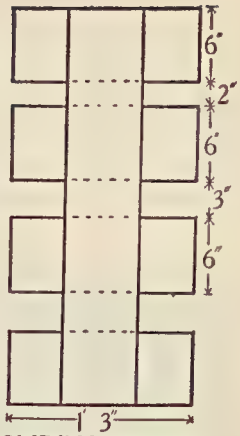
Goats may be tattooed in the same manner as sheep and cattle. All goats registered with The Goat Society of Australia must be tattooed in the ear with the breeder's distinguishing symbol or letter and with the breeding number of the animal within 30 days of birth.

Tattooing is simple. The outfit may be purchased, or hired from the Royal Agricultural Society of Victoria. The smaller-sized outfits with $\frac{5}{8}$-inch letters and numbers (stencils) should be used. The pliers and stencils should be sterilized by cleaning and immersing in boiling water. The ears should be cleansed of grease with petrol or methylated spirits. The correct stencils should then be placed in the pliers, which are first used on a piece of cardboard to make sure that

Dehorning of goats is most desirable.







Sheep Crate
Materials Required

3" × 2"	bearers	2/4'7"	pieces
3" × 1"	uprights	6/3'	"
3" × 1"	end pieces	2/1'6"	"
6" × 7/8"	flooring	8/1'4"	"
6" × 1/2"	side slats	6/4'6"	"
6" × 1/2"	end slats	3/1'6"	"
6" × 1/2"	top slats	5/1'4"	"
6" × 7/8"	door	1/2'8"	"
6" × 1/2"	door	4/1'3"	"
1" × 1"	for door groove	1/2'8"	"

Nails & Bolts

Plans and specifications for construction of a sheep or goat crate.

they are in the correct positions and, if correct, the stencil cut into the inside of the ear. A paste made from India ink or Zebra stove polish (cakes) should immediately be rubbed into the stencil cut in the ear. The ear should be examined to make sure that the tattoo is correct. If any error has occurred, the tattoo as cut in the ear should be recorded and no attempt made to alter it. Care should be taken to see that the ear is not sucked until it has healed, otherwise the tattooing ink may be removed.

Transporting Goats—Crates

Goats may be transported by rail or road vehicles in sheep crates in the same manner as other small farm animals.

The construction of crates to despatch individual animals by rail and road transport is a relatively simple matter. Specifications with plans for constructing a sheep crate are shown in the accompanying illustration.

The crates need to be wide enough to just comfortably accommodate the animal. If the crates are too wide, the animals try to turn round, placing an unnecessary strain on both the crates and themselves. If the crates are too small the animals will be rubbed. Large crates are unnecessarily heavy.

The side boards should be nailed on the inside of the uprights so that they cannot be pushed off as most of the strain is on the sides.

Before despatching, the sliding door should be securely fastened to prevent it being lifted up (and open) when the crate is being handled.

It is important that all crates be clearly labelled to ensure against any delays in transit.

The same crate may be built to hold calves, pigs and goats as well as sheep. Wherever possible, it is desirable to construct crates just large enough for the type of animal being despatched.

It should be borne in mind that calves, in proportion to their length, are much higher than sheep, and crates built for calves are best made at least 9 inches higher than the sheep crate illustrated. Crates to hold calves up to about four months old should be made 4 ft. 7 in.

long, 3 ft. 9 in. high, and 1 ft. 6 in. wide. Such crates would also hold sheep, goats and pigs. For calves six months old, a crate 6 ft. long, 4 ft. 6 in. high, and 1 ft. 9 in. wide may be required. The gross weight of a calf in such a crate will be about 5½ cwt., and this is about the weight limit that can be handled.

Goats are about the same height as sheep. In large numbers, goats may be transported in sheep trucks.

Values

The cost of good quality milk goats varies considerably but the value of good registered pure-bred animals ranges from 5 to 10 guineas each. The demand for pure-breds is much greater than the supply and prices are firm. Useful grade does can frequently be purchased for 25s. to 50s. each.

Importation

The only countries from which goats may be imported are Great Britain, Eire, the Channel Islands, and New Zealand. Before breeders purchase goats in Great Britain for import to Australia, they should first obtain a copy of the regulations under the *Quarantine Act* 1908–1924 (Animal Division) from the Chief Quarantine Officer. Goats may be imported direct from New Zealand provided that they are accompanied by a certificate of freedom from disease from a Government Veterinary Surgeon.

Aims of Breeders

In the United States Year Book, Simmons and Lambert have concisely set out the lines along which breeders should work and the following paragraphs are quoted from their article :—

> "In addition to milk production, attention should be given to improvement in the fat content of the milk, to increasing the average duration of lactation, to the improvement of fertility and the development of strains that will breed at any season. Practically no attention has been given to these characteristics, all of which are important.
>
> But improvement of the goat alone will not solve the problems of the industry as a commercial business.
>
> If an industry is to grow, it must have new or better markets for its products. Research is greatly needed to develop uses for goat products, and one of the chief activities of breed organisations should be to encourage research in this field. Among the problems that might well be studied are (1) the value of goats' milk for the feeding of infants, invalids, and persons allergic to cows' milk and its products, (2) its value for the making of cheese of various types, (3) methods for the preparation of condensed milk in order to make it more widely available, (4) the creation of a greater demand for goat meat, by advertising and the development of new and better recipes for its preparation and (5) studies on the economics of production under various systems of farming."

NECROTIC ENTERITIS OF SWINE

Necrotic enteritis is a common disease affecting pigs of any age, but more commonly those from weaner to porker age. It is a bacterial infection, the invading bacteria localising in the bowel wall and resulting in systemic disturbance with a temperature rise, capricious appetite and diarrhoea. The droppings may change in colour, commonly being of a dirty, greyish colour. A percentage of pigs may die soon after infection, but the general tendency is for the disease to assume a chronic form in which the pigs do not grow normally. Some pigs will recover, but never respond really well to their food intake, and in addition are likely to remain as carriers of the infection.

The disease is scheduled under the *Swine Act* and its suspected presence should be reported immediately to the District Stock Inspector.

Post-mortem examination of affected pigs reveals a thickened lining membrane of the bowel, with large amounts of dead tissue and a congestion of blood vessels. Treatment with drugs such as sulphaguanidine is costly and, on that account is not recommended. Attention to sanitation and management is of greater importance than treatment with drugs in controlling the disease and affected pigs should not be persevered with. Advice on isolation of pigs and the drainage and disinfection of sties may be obtained from the District Stock Inspector.

[Contributed by the Live Stock Division.]

ORCHARD NOTES

By G. W. GAYFORD, B.Agr.Sc., *Horticultural Instructor*

Bush Berry Fruits

THE cultivation of bush berry fruits is practically confined to the hill districts east of Melbourne where the rainfall varies between 35 and 45 inches per annum, a reasonable proportion of which falls in the summer. The soils vary considerably in this area and those most favoured for berry growing are the fertile, well-drained, chocolate soils of volcanic origin. The hilly nature of this area, combined with stands of native timber to act as windbreaks, provide sheltered sites for the growing of this delicate fruit. However, some damage to plants and fruit may occur as a result of northerly winds in hot weather. The chief advantage of the district is that it is adjacent to the Melbourne market and fruit picked one day can be sold next morning.

Loganberry bush after pruning, showing ten canes which grew last season, roped around a trellis wire, Weaker canes, and those which fruited last year, have been removed.

The chief difficulty in berry growing is the relatively high labour cost involved in harvesting the fruit. In the peak harvesting period, if a spell of warm weather occurs, it may be necessary to pick over the plants every day. Pruning is a tedious task, especially with such rank-growing plants as the lawtonberry.

Varieties.

Loganberries and raspberries are the most profitable and popular berry fruits. Gooseberries and the lawtonberry (a type of blackberry) are grown to a lesser extent. A few red currants are grown but black currants are not grown commercially in Victoria, supplies of fresh fruit and pulp being imported from Tasmania.

The main varieties of berry fruits are as follow :—

Black Currant—Dunnett's, Carter's Black Champion, Black Naples, Boskoop Giant.

Red Currant—La Versailles, Fay's Prolific.

Gooseberries—Best red varieties are Roaring Lion, Crown Bob, Billy Dean. Green varieties are Heart of Oak, Lord Crewe.

Raspberries—Great American, Lloyd George, Northumberland Fillbasket, Red Antwerp, Everbearing.

Loganberry.

Lawtonberry.

Youngberry.

Distances Apart for Planting.

The distances apart for planting berry fruits are as follow, but these distances may be varied

according to soil condition, i.e., for deep, well-drained, fertile soils, the greater distances should be used.

	Rows.	Plants in Row.
Black Currants	8 ft.	4 to 6 ft.
Red Currants		
Gooseberries		
Loganberries	6 to 8 ft.	6 ft.
Raspberries	6 ft.	4 to 6 ft.
Lawtonberries and Youngberries	8 ft.	6 ft.

Pruning Methods.

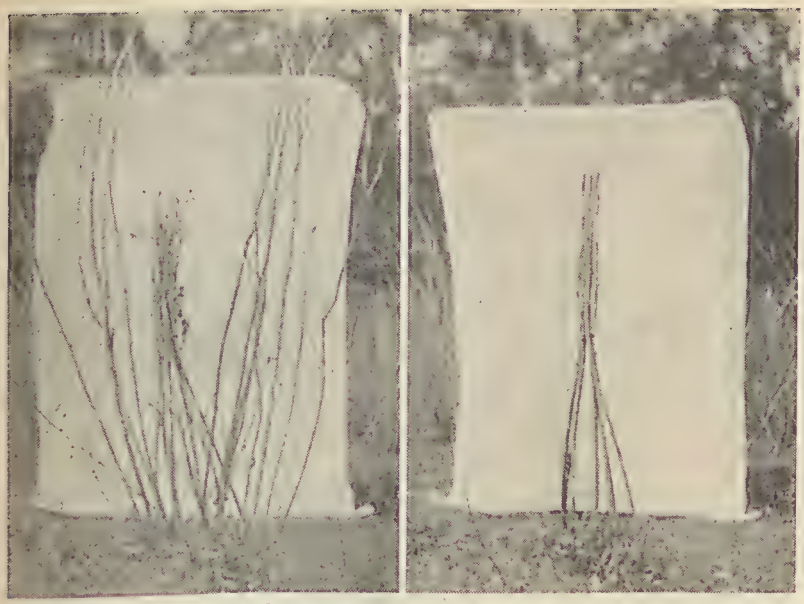
Pruning is usually carried out in the winter, although loganberries, youngberries, and lawtonberries may be pruned after harvesting.

Black Currants.—After black currant plants are to be planted, all growth is removed to ground level. From this crown in the following season new shoots arise. At the next pruning, the weakest of these shoots are removed and the stronger five or six inch shoots are allowed to remain untipped. These shoots will carry fruit in the next season and also develop fresh growth. Strong new shoots will grow up from the crown. Pruning then, and in succeeding years, consists of the entire removal of some of the two-year-old shoots. Some may be allowed to remain, but are cut back to a fresh growth about half-way down their length. The weaker new shoots should also be removed, otherwise the bush becomes too crowded.

Gooseberry.—The object in pruning the plants is to obtain a bush, shaped like a miniature tree. When received from the nursery, the gooseberry plant will probably consist of a main stem, from which rise several branches. The plants should be set in the ground at the same level as they were growing in the nursery. The lowest branch should not arise from the main stem below four to five inches. Three or four branches should be allowed to remain, each pointing out from the centre, and each should be cut back four to five inches in length. Next season, growth will occur from these branches and a couple of the strongest shoots near the end of each branch should be allowed to remain, other shoots, particularly those growing towards the centre of the bush, being removed. It is important to keep the centre of bushes fairly open as this facilitates picking the fruit.

After this pruning, shoots arising from the main branches should be cut back to about four to five inches, where they do not become too crowded, but if they cross other shoots or branches they should be entirely removed. Fruit is borne on the previous season's growth and on short spurs occurring on older wood. The object in pruning, therefore, is to allow a certain amount of new growth to remain throughout the bush. Occasionally new growth,

Left: Lawtonberry bush before pruning. Right: After pruning. Old fruiting canes have been removed and new canes from adjacent bushes have been tied together in a loop.



Left: Raspberry bush before pruning. The old canes in centre bore the main crop last season. Right: After pruning, the old canes removed and seven of the strongest new canes left.

occurring low down in the bush, may be used to replace an old branch which is becoming devoid of fruit-producing wood and should therefore be removed.

Red Currant.—The red currant is pruned in much the same way as the gooseberry. Fruit is borne on two-year and older wood. Persistent spurs produce fruit on older wood, so that the main object in pruning is to thin out growth to prevent the bush from becoming too crowded and keep the centre of the bush free of growth.

Raspberry.—After planting, all above-ground growth should be removed. In the first growing season five to six canes will be produced. These may not bear any fruit unless the variety is "Everbearing", in which case a few raspberries may be carried late in the summer. The procedure at the next pruning is to allow three or four of the strongest canes to remain, cutting the weaker ones to ground level. The remaining canes are topped at a height of five or six feet and bunched together. If a trellis wire is available, the canes may be tied to this, but it is not essential. These canes produce the main crop in the following spring. New growth is erect and does not interfere with the cropping of the plant. In the "Everbearing" variety, the main crop also occurs on last season's growth. The midseason crop is carried on low straggly growth near ground level. Late autumn fruit is carried on top of the current season's canes.

For all varieties, at each subsequent pruning, all two-year-old canes are removed. Of the current season's growth, six to eight are selected, to carry the next season's crop, the weaker canes being removed at ground level.

Loganberries and Youngberries.—Pruning is essentially the same as for the raspberry, except that a trellis is required. A single wire trellis is sufficient. Fruit is borne on previous season's growth. New growth is straggly and is usually pegged along the ground under the trellis out of the way of cultivating implements. At pruning, growth which has carried fruit is cut away at ground level and six to eight of the new canes are gathered up, roped together, and twisted along the trellis wire, where they are tied in position.

Lawtonberry.—Pruning is the same as for the loganberry, except that growth is much stronger. Half the new canes are bent to the right to be roped together and tied with the next plant and similar treatment is provided for the other half of the canes, which are bent over to the left.

Cultivation and Manuring.

Bushes should be kept cultivated for weed-control during the summer. If irrigation water is available, the furrow method should be used. If available, applications of stable manure (ten to fifteen tons per acre) or poultry manure (two to three tons per acre) should be ploughed under in the spring. At the same time, an application of some mixed fertilizer, such as 3:1 super: ammonia may be applied. During the winter, miscellaneous herbage should be allowed to grow for ploughing under with fertilizers in the spring. If possible, a crop of green manure should be planted during the autumn for ploughing under in the spring. Leguminous crops are most satisfactory because of their high nitrogen content. They should be planted at the rate of one and a half to two bushels per acre with two cwt. per acre superphosphate.

(*Continued on page 187*)

THE FLOWER GARDEN

By T. H. KNEEN, B.Agr.Sc., *Acting Principal, School of Horticulture, Burnley Gardens*

ALTHOUGH the peak of the autumn plantings of annuals has passed, there is still time, early in April, to plant out seedlings which will supply flowers and fragrance for both home and garden in the spring. For a bright show and a useful supply of cut flowers, it is difficult to improve on Iceland poppies, stocks, and calendulas. Other useful plantings are nemesias, primulas, wallflowers, pansies, and violas.

Final plantings of bulbs may be made early this month. When purchasing bulbs, make sure they are firm, plump, and free from disease-markings of any sort. When planting groups which will be left for some years, it is a good plan to mark their position with small stakes or labels so that they will not be disturbed or damaged during their dormant period.

Beds of summer annuals, which have passed their prime, should be manured and dug over, and the plant refuse added to the compost heap. If they are still useful, remove any faded blooms.

Dahlias will require tying to support the succulent growth which is now evident. Chrysanthemums also will need staking and tying, and, if larger blooms are sought, each shoot should be limited to three or four buds.

Gladioli bulbs will require lifting and storing. The best time to do this is about six weeks after flowering and when the foliage is losing its green colour. Cut the tops back to about six inches above the corms, allow to dry, and then store in a cool, airy shed.

Many lawns were lost during the drought conditions of the last two years. If the ground has already been prepared, April is quite a good month to make sowings of English grasses which will become reasonably well established before the cold weather sets in.

Sweet Peas

Spring-flowering types of sweet peas can be sown this month in well-prepared soil. It is well to remember, however, that the young plants will be required to grow through the cold winter months and therefore a naturally well-drained soil is desirable. Sweet peas will thrive in a range of soils from light sandy types, which are well supplied with organic matter, to moderately heavy types.

Trenching to a depth of 1½ to 2 feet and a width of 2 feet, together with a liberal application of well-rotted cow manure, up to 6 inches, at the bottom of the trench, is very commonly adopted, but it is better to sacrifice some depth in heavier soils and dig over a wider area. A trench, dug into a tenacious sub-soil, may ultimately form a trap for water and cause damage to plants which appeared to be well established. If the top-soil is shallow, a built-up bed will provide extra depth as well as good drainage.

The situation chosen should be one exposed to the full sun, but protected from strong, drying winds. A sunny fence, facing east, is difficult to better, and simplifies the provision of support. However, the best results can be obtained by growing sweet peas in the open garden, preferably in rows running north and south to encourage full blooming on both sides of the row. As a suggestion, double rows, about six inches apart, with the seed "staggered" six inches apart in the rows, might be adopted. The plants can then be brought up to the one supporting trellis, which can be of a coarse wire-netting or simply vertical strands of hay-band supported on three horizontal wires. The supports should reach to a height of at least six feet.

When preparing the soil, incorporate lime at the rate of ½ lb. to the square yard. Just before planting, work in 1 to 2 oz. of superphosphate to each square yard, or especially in lighter soils, a similar quantity of 3:1 mixture of superphosphate and potassium sulphate.

Seed should be sown six inches apart and at a depth of one inch. An even germination can be assisted by soaking the seeds for about twelve hours, or by chipping the seed coat opposite the eye. In the latter case, the seed coat must be cut right through.

The young plants should be given some support when about four inches high. In order to secure quality blooms, it is necessary to limit the number of stems to each plant to two or three by removing most of the lateral growths.

For the home garden little additional care is needed, except to pick the blooms constantly to prolong the flowering period.

A reasonable range of named and mixed varieties of sweet peas is available from seedsmen, covering the full range of colours, which are a feature of this popular and fragrant annual.

THE VEGETABLE GARDEN

Broad Beans

Sowings at monthly intervals may be continued this month and into May. The main varieties are *Leviathan Long Pod* (tall growing) and *Cole's Dwarf Prolific*. Sow seed 6 inches apart in single rows 2 to 3 feet apart, or in double rows 1 foot apart with 4 feet between the sets of double rows. Thirty plants, spread over three sowings, are sufficient to keep the average family well supplied for many weeks. The harvesting period can be extended considerably by picking the young, tender pods and using them in the same way as French beans.

This crop is subject to attack by aphis, which should be controlled by the use of nicotine-sulphate, one oz. to four gallons of water, or nicotine dust. The principal fungous disease is rust, which causes dark brown-coloured spots to appear on the foliage. The control for this disease is Bordeaux mixture, used at normal strength.

Lettuce

The variety of lettuce sown at this time of the year should be one capable of growing in the cold winter months. *Imperial D* is a suitable variety. Beds should be raised to ensure good drainage. The plants will respond well to side dressings of nitrate of soda worked into the soil at fortnightly intervals. One ounce to 12 yards of row is a sufficient dressing, which should be lightly worked into the soil 3 or 4 inches from each plant.

Peas

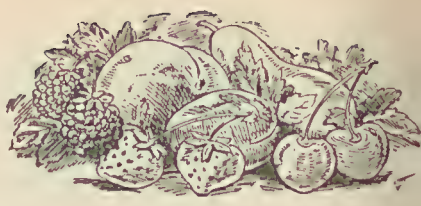
Ground may be prepared for sowings of early peas in June, July, and August. They will not tolerate wet conditions, so that sowings should be confined to light, well-drained soils. The soil should be deeply dug and limed at the rate of ½ lb. per square yard. At the final preparation, work in 1 oz. of superphosphate to each square yard. Varieties suitable for planting are *William Massey* (June to August) and *Greenfeast* (July to December).

Onions

Plants of the early, non-keeping varieties, such as *Early Flat White*, *Silverskin*, and *Australian White Queen*, which were sown in February and March, will be ready to plant out this month, or when they have reached a height of 6 inches. The roots and tops should be trimmed with a sharp knife and the seedlings planted about 1 inch deep. They should be set 3 to 4 inches apart in the rows, which should be 10 to 12 inches apart. Plant in full sunshine in order to reduce the possibility of infection by onion mildew.

PRESERVATION OF PEARS . .

By RUTH BROMFIELD
Fruit Preserving Expert



BECAUSE of the scarcity of fruit and sugar this season, the housewife may not have preserved as much fruit as she would have wished. Pears are still available, however, and because of their mild flavour are well adapted to combination with other fruits.

Unlike most other fruits to be used for preserving, pears should be removed from the tree before they are ripe and stored in a cool place until ripe but not soft. The Williams' Bon Chretien and Packham's Triumph varieties are considered excellent preserving varieties, but the hard winter pears are satisfactory if properly ripened and then cooked till almost tender in unsweetened water before packing into the jars. Then cover with syrup made from the liquid in which the fruit was cooked.

Bottling Pears

Wash, pare, halve or quarter and core pears. Drop the peeled fruit into water to which salt has been added at the rate of 2 tablespoons to the gallon. This prevents the fruit from discolouring. When sufficient fruit is ready for processing, rinse and pack firmly into vacuum jars. Cover with a cool syrup made of 1 cup of sugar to 3 cups of water. Adjust lids according to type of jar and process for 25 to 30 minutes in a steam bath. Use the longer period for large or hard fruits.

VARIATIONS FROM THE PLAIN BOTTLED PEARS.

For *Orange Pears.*—Use the juice and rind of half an orange to each quart of syrup. Remove the rind before covering the pears.

For *Cinnamon Pears.*—Use stick cinnamon and a few drops of red colouring.

For *Ginger Pears.*—Use water in which a piece of root ginger has been boiled to make syrup.

For *Passionfruit Pears.*—Add the juice and pulp of two or three passion fruits to each jar of pears.

For *Pineapple Pears.*—Use pineapple juice instead of water for making syrup.

For *Plum Pears.*—Use tart red plum juice instead of water for making syrup.

NOTE.—To obtain fruit juice, cut fruit into small pieces and add water sufficient to prevent the fruit from sticking. Simmer until the fruit is broken up and soft. Strain and use for syrup.

Pears Baked.—Wash, stem, and remove blossom end from firm ripe pears. Place in pan with enough water to prevent sticking. Bake until tender. Pack into jars and cover with syrup made of equal parts of water and sugar or honey. Process 20 minutes in steam bath.

Pear and Melon Balls.—Use equal portions of balls or cubes of firm ripe fruit. Cover with boiling syrup (1 part sugar to 3 parts water) and allow to stand till cold. Pack the fruit into jars. Add 1 tablespoon lemon juice to each jar and cover with the syrup. Process 20 minutes in a steam bath.

Overflowing the jars with syrup.

Pear Mint.—Make syrup of equal parts of sugar and water. Cook pears until tender. Add a few drops of peppermint flavouring and green colouring to the syrup. Pack pears in vacuum jars. Cover with syrup. Process in steam bath 10 minutes.

Pear Butter.—Wash, pare and core ripe pears. Add just enough water to prevent sticking. Cook until soft, then press through a sieve. Add 2 tablespoons lemon juice and ¼ teaspoon nutmeg or other spices and from 1 to 1½ cups sugar to each quart of pulp. Boil rapidly until thick. Pour into sterilized jars (boiled for 10 minutes). Process 10 minutes in steam bath. Seal. Screw-top jars may be used and sealed with melted wax.

Pear Honey.—Pare, core, chop, and measure hard ripe pears. Add a little water to start cooking. Boil 10 minutes. To each quart of chopped pears, add 3 cups sugar, juice of 1 lemon, grated rind of half a lemon, and ½ teaspoon of ground ginger. Boil until thick. Pour into hot jars. Seal at once. (Orange and nutmeg may be used instead of lemon and cinnamon.)

Pear and Passionfruit Jam.—4 lb. hard ripe pears, 2 dozen passionfruit, 3½ lb. sugar. Cut up pears, scoop out passionfruit pulp. Simmer all together until of a good colour and consistency. Eight of the passionfruit shells can be boiled separately, the inside scooped out, cut up and added.

Pear Ginger.—4 lb. firm pears, 3 lb. sugar, 1 quart water, 1 lb. preserved ginger, grated rind of 2 lemons, 3 tablespoons vinegar.

Peel, core, and slice the fruit; grate the yellow part of the lemon peel. Cut the ginger into even sections. Meanwhile make a syrup of the vinegar, water, and sugar, allowing it to boil for 5 minutes; then pour it over the prepared fruit and allow to remain for 24 hours. Simmer all together slowly for about 2 hours.

NOTE.—Housewives unacquainted with the method of preserving fruit by the quick steaming method, may obtain a detailed description in the Department's bulletin, Preserving Fruits and Vegetables. This publication may be obtained for the sum of 1s. on application to the Director, Department of Agriculture, Melbourne, C.2.

ORCHARD NOTES *(continued from page 183.)*

HARVESTING.

The biggest proportion of labour required in growing berry fruits is absorbed in the harvesting. This is a very tedious job, and, although some varieties are producing fruit over a considerable period (raspberries, for instance, produce fruit from November to May), there are sharp peaks of production during warm weather; then the ripe fruit must be removed quickly. It is usually necessary to pick over the bushes every day during these peak periods.

The fruit should be picked in the early part of the day, placed direct in quart punnets, and stacked in crates in a cool position until they are transported to market.

PESTS AND DISEASES.

The raspberry is sometimes attacked by a white-root fungus, which causes loss of vigour and eventual death of the bushes. No effective control is yet known for this disease but investigations are in progress. As a precaution, growers should maintain bushes in a healthy condition by adequate manuring.

The currant borer moth mainly causes damage to black currants, but red currants and gooseberries may also be damaged. Grubs burrow down the stems which turn yellow and die. No treatment is available, but affected canes should be removed at ground level in the late winter and burnt.

A virus disease known as mosaic, causing a mottling of the leaves, sometimes affects raspberries. Affected plants should be removed and destroyed.

TUBERCLE-FREE HERDS

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Aboriginal Station ..	Lake Tyers	86	Maloney, P. J.	Tongala	66
Armstrong and Son ..	Wangaratta	105	Middleton, J. A. ..	Longwarry North ..	70
Ballarat Orphanage ..	Ballarat	116	Murray, M. G.	Lima	26
Banyule Stud Pty. Ltd. ..	Wangaratta	55	McIntosh, J.	Merrigun	35
Beggs, A. R.	Beaufort	112	McNabb and Son, G. A.	Irrewillipe East ..	159
Black, I. S. Estate ..	Mount Noorat ..	60	Nancarrow Bros. ..	Kerang	48
Carne, W. J.	Pakenham Upper ..	27	Noonan, G.	Benalla	35
Clark, W. J.	Monomeith	140	Noonan, Mrs. S. A. ..	Benalla	51
Cowan, G. L. S. ..	Bacchus Marsh ..	59	Northcote Children's Farm	Bacchus Marsh ..	48
Cribbes, T.	Wangaratta	39	Onley, W. H.	"Glenholme," Caldermeade	76
Deering, J. T.	South Wangaratta ..	86	Parker, Mrs. L. M. ..	Tallarook	67
Dennis, Mrs. A. A. ..	Frankston	23	Payne, A. E. T. ..	"Yarra View," Lilydale	67
Dookie Agricultural College	Dookie	92	Payne, T. E. N. ..	"Woodburn," Kilmore ..	44
Everist, F. R. ..	Tyabb	20	Poole, M. A., and D. ..	Caldermeade	120
Foletta, G. G. and Son ..	Buxton	120	Poole, M. A., and D. ..	Yannathan	104
Geelong Grammar School	Corio	78	Potter, W. J.	Longwarry North ..	130
Gleeson, P. J. and Son ..	Tynong	261	Powell, T. S.	"Carellen," Mansfield ..	43
Gorman, A. W... ..	"Cathcart," Alexandra ..	57	Reid, Mrs. B., Estate of	Bundoora	74
Griffin, G. W.	Gladysdale	50	Richardson, Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Griffiths, J. G.	Benalla	151	Roe, Thomas H. P. ..	Cobram	27
Gross, Mrs. G. F. ..	Green Lake	21	School of Horticulture ..	Burnley	6
Hamilton, A.	Flinders	64	State Experiment Farm ..	Rutherglen	47
Henry, J. A.	Warrnambool	45	State Research Farm ..	Werribee	245
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	55	Stephens, Dr. F. ..	Vermont	32
Jakobi, L. W.	"Granada," Yannathan	89	St. Joseph's Home ...	Sebastopol	53
Johnson, F. G... ..	Horsham	11	Vagg, T. R.	Officedale	40
Lady Talbot Milk Supply Co.	Cranbourne	513	Vagg, E. J.	Leongatha	48
Lawrence, P. H. ..	"Rainga," Tarrawarra ..	83	Warnock, J. A... ..	Benalla	76
Light, D. T.	Noradjuha	8	Waterhouse and Son ..	Pakenham	55
Longerenong Agricultural College	Dooen	42	Wells, W. G.	Caldermeade	67

In addition to the above-mentioned, the herds set out hereunder may be considered free of tuberculosis. All these herds have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the accreditation scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

Name.	Address.	Number in Herd at Last Test.	Name.	Address.	Number in Herd at Last Test.
Abbey, S. G.	Mernda	7	Baglin, E.	Wallington	14
Adams, W. J.	Traralgon	48	Baker, A.	Bannockburn	32
Alexander, Miss R. ..	Ballarat East	1	Balharrie, J. A. ..	Whittlesea North ..	68
Allender and Ireland ..	Whittlesea	65	Banfield, J. G.	Rosanna	66
Almond Bros.	Mernda	112	Barclay, A. H.	Whittlesea	93
Anderson, A. R. ..	Craigieburn	131	Barker, Mrs. E. M. ..	Huntly	8
Anderson, Mrs. N. J. ..	North Geelong ..	18	Barron, Mrs. A. ..	East Brunswick ..	10
Andison, J. A.	Thomastown	53	Bates, D. S.	Whittlesea North ..	22
Andrew, J. C.	Whittlesea	47	Bates, J.	Connewarre	21
Andrew, J. H.	Whittlesea	18	Batten, R. J.	Wollert	51
Andrew, T. S.	Whittlesea	91	Beasley, R.	Youroke	18
Andrews, E. H. ..	Templestowe	19	Bebbington, J.	Whittlesea	82
Angliss, Mrs. R. ..	Ballarat	1	Beck, J. P.	Ceres	48
Angus, W.	Moolap	6	Beck, R. S.	Ceres	34
Armstrong, Mrs. M. A. ..	Sebastopol	15	Bellis, Mrs. A.	Fyansford	15
Artley, A.	Sebastopol	11	Benson, R.	South Morang	40
Atkinson, J. P. ..	Sebastopol	28	Bertuch, A. W... ..	Harcourt North ..	24
Atkinson, A.	Cambrian Hill ..	22	Best, J. H.	Yarragon	36
Atkinson, V.	Cambrian Hill ..	20	Best, W. H.	Yarragon	24
Attwood, F. A... ..	Eaglehawk	18	Best and Carter ..	Yarragon	110
Baddon, D. W... ..	Yarragon	74	Bills, R. G.	Cambrian Hill ..	37

Name.	Address.	Number in Herd at Last Test.
Bingley, R. P.	West Geelong	31
Blackmore, P. J.	Ballarat North	57
Blake, Mrs. J.	Yarragon	11
Blood, J.	Ballarat	8
Blythe, R. E.	Conneware	71
Bodycoat, A.	Wollert	40
Boland, Mrs. A.	Yarragon	31
Boland, D.	Yarragon	40
Bone, E. R.	Bell Brae	14
Booth, Mrs. A.	Warrandyte	7
Borland, J.	Yarragon	87
Bourke, C. G. D.	Upper Plenty	51
Bourke, G. J.	Fairfield	82
Bourke, J. W.	Somerton	33
Bourke, W. J.	Alfredton	26
Bradbury, G.	Kangaroo Flat	19
Brady and Cunningham	Doncaster	28
Brain, J. A.	Ceres	41
Brereton, E.	Kennington	25
Briers, J.	Queenscliff	5
Brock, J. N.	Epping	16
Browell, L.	Golden Square	21
Brown, J.	Geelong West	6
Brown, Mrs. A.	Maiden Gully	11
Brown, W.	Coburg	77
Brownhill, C. H. H.	Bundoora	2
Bryden, A. C.	Bendigo	18
Bumpstead, K.	Moolap	10
Bunting, J.	Epping	30
Burke, T. S.	Huntly	19
Burns, D.	Moolap	8
Burville Bros.	Mt. Duneed	40
Butler, W.	Wallan	71
Cahill, J. M.	Warrandyte	8
Callaghan Bros.	Thomastown	66
Callaghan, L.	Epping	32
Callaghan, T.	Thomastown	60
Cameron Bros.	Belmont	67
Cameron, G. A.	Connewarre	36
Cameron, J. J.	Connewarre	53
Campbell, T. S.	Yarragon	8
Cardwell, E. F.	Whittlesea	62
Carroll, M.	Fyansford	28
Carr, G.	Leopold	20
Carr, W. J.	Wollert	64
Carter, R. H.	Fyansford	23
Catt, G. P.	Yarragon	53
Cavanagh, Miss	Sedgwick	5
Challis, L. J.	Connewarre	57
Chandler, K. J.	Doreen	29
Charles, J. E.	Torquay	36
Child, G. P.	Epping	43
Christian Bros.	Doreen	38
Clark, H. M.	Nerrina	18
Clark, P. W.	Whittlesea	68
Clark, W. and T.	Kal Kallo	68
Clemence, S.	Warrenheip	23
Close, A. E.	Ballarat	37
Clunes, P.	Coburg	42
Cochrane, C.	Ballarat North	32
Cochrane, Mrs. B.	Hurstbridge	4
Cocks, J. J.	Marong	17
Collis, R.	Yarragon	1
Conway, L. T.	Sedgwick	10
Cook, W.	Brown Coal Mine	133
Cooke, Mrs. C. H.	Moolap West	30
Cooke, S. J.	Belmont	38
Cornfoot, D. H.	Whittlesea	44
Cotchin, E.	Epping	57
Coulter, G.	Ballarat North	19
Coulthard, J. J.	Whittlesea	72
Cox, R. H.	Heidelberg	65
Cox, H. S. and W. F.	Miners Rest	67
Crack, Mrs. E.	Bendigo	12
Craker, Mrs. H.	Warrandyte	5
Crawford, J.	Yarragon	44
Cross, G. A.	Mount Rowan	36
Crowe, P.	Gnarwarre	20
Crowle, A. J.	California Gully	7
Cuddihy, T.	Lovely Banks	26
Cunningham, E. C.	Templestowe	35
Curtis, W. D.	Wallington	35
Dalton, F. J.	Spring Gardens	12
Dans, C.	Connewarre	80
Davey, C.	Morwell	103
David, Mrs. M.	Ballarat	2
Davies, A. H.	Drysdale	20
Davies, G.	Canadian	19
Dawson, J. F.	Whittlesea	41
Delany Bros.	Broadmeadows East	80
Dendle Bros.	Moolap	19
Dennett, C. A.	Craigieburn	40
Deppler, L.	Batesford	16
Deppler, W. W.	Yarragon	91
Deutscher, H. W.	Mernda	137
Devereux, Mrs. A.	Ballarat	3
Dheen, J. O.	Alphington	18
Dickinson Bros.	Sebastopol	48
Dillon, L. W.	Epsom	18
Doggett, J.	Dingee	57
Doggett, T.	Kangaroo Flat	17
Douglas, Mrs. J.	Alfredton	52
Douglas, J. & N.	Harcourt	46
Downey, J.	Bellarine	41
Downing, J.	Canadian	4
Dowton, Mrs. H.	Yarragon	47
Draper, L. S.	Wollert	47
Draper, T. B.	Whittlesea	43
Drechsler, J.	Sedgwick	10
Duke, J.	Ballarat East	1
Dunnett, M.	Yan Yean	26
Dunstan, W.	Pascoe Vale	29
Dwyer, F. P.	Greensborough	58
Dwyer, J.	Donnybrook	28
Eagle, R. A.	Harcourt	27
Earl, H.	Highton	3
Eckersley, W. H.	Alfredton	40
Eddington & Keil	Tullamarine	40
Edwards, S. R.	Sebastopol	14
Egan, Mrs. N.	Huntly	18
Elder, W. C.	Epping	54
Elford, S.	Magpie	35
Ellis, P.	Tullamarine	19
Erwin, E. J.	Connewarre	13
Evans, D.	Mount Duneed	15
Evans, G.	Marshall	41
Faderson, J. H.	Mandurang	108
Fairbrother, J. E.	North Geelong	23
Faulkner, G.	Yarragon	40
Faul, Mrs. A. F.	Huntly	11
Fergusson, M. A.	Whittlesea	98
Ferres, Mrs. M. E.	Mount Clear	21
Finn, J.	Templestowe	38
Fitzpatrick, Miss M.	Eaglehawk	4
Fitzpatrick, W.	Mandurang	9
Fitzgerald, D.	Leopold	45
Fitzgerald, E.	Leopold	80
Fitzsimmons, B.	Lower Templestowe	35
Flanagan, A. D.	Epsom	10
Flannagan Bros.	Batesford	81
Flynn, O.	Epsom	21
Foot, Mrs. R. G.	Connewarre	19
Fox, A.	Mernda	53
Fox, Mrs. C. H.	Epping	48
Franklin Bros.	Sebastopol	29
Franklin, F. M.	Sebastopol	15
French, T. W.	Wollert	57
Fuller, R. J.	Connewarre	30
Galbraith and Walker	Greensborough	33
Gallagher, J.	Golden Square	4
Gallus, E. H.	Doncaster	18
Gardiner, A. M., Estate of	Whittlesea	101
Gardiner, C. E.	Epping	29
Gargan, M. J.	Marshall	43
Gartside, Mrs. & Sons	Harcourt	28
Gass, S. Mc.	Wollert	29
Gentner, H.	Eaglehawk	4
Gerrett, W. T.	Ballarat North	19
Gibbs C.	Arthur's Creek	30
Gillett, R. L.	Cherry Tree, Sebastopol	23
Godfrey, A. J.	Yarragon	49
Godfrey, W. and W.	Moolap	42
Gogoll, Mrs. M. L.	Torquay	6
Gooch, W. N.	Sydenham	61
Graco, Bros.	Keilor	24
Graff, Mrs. M. G.	Mernda	16
Graham, A. E.	Connewarre	35
Graham, A.	Whittlesea	39
Gray, J. H.	Herne Hill	74
Green, J.	Eppalock	15
Green, R.	Leopold	27
Greer, A.	Wollert	19
Griggs, Mrs. H.	Yarragon	47
Grinter Bros.	Whittington	52

Name.	Address.	Number in Herd at Last Test.
Grinter, T.	Whittington	33
Guidice, J. J.	Kangaroo Flat	7
Gunn, A. J. B.	Ballarat	7
Gunn, W.	Kangaroo Flat	11
Hall, A. M.	Bullock Creek	31
Hall, Mrs. J. B.	Whittlesea North	9
Hall, W. J.	Essendon	16
Halliwell, G.	Wollert	84
Hamilton Bros.	Huntly	21
Hamilton, C. H.	Yarragon	59
Hamilton, T. D.	South Geelong	32
Hancorne, Miss M. R.	Yan Yean	33
Hanmer, Mrs. J. T.	Keilor	63
Hanrahan, Miss E.	Sebastopol	4
Hanrahan, N.	Sebastopol	6
Hargrave, Mrs. E. J.	Whittlesea	26
Hargreaves, H.	Emu Creek	9
Hargreaves, W.	Emu Creek	11
Harkness, H. J.	South Morang	12
Harmer, L. T.	Thomastown	38
Harrison, H. N.	Ballarat	17
Harvey, J. and L.	Yarragon	79
Harvey, Mrs. M. M.	Yarragon	78
Hawkes Miss D.	Warrandyte	14
Hayes J. J.	Smythe's Creek	6
Hedges J. T.	Ballarat	9
Hegarty J.	Trunk Lead	4
Hehr R.	Wollert	29
Henderson J.	Donnybrook	58
Henshaw E.	Lower Templestowe	11
Herd J.	Epping	38
Hewitt C. J.	Wattle Glen	7
Hewitt H.	Ballarat	13
Hickinbotham Miss N.	Whittington	10
Higgs, R. N.	Yan Yean	58
Hilderbrand, P.	Sebastopol	21
Hill, J.	Somerton	63
Hill, J. E.	Mt. Duneed	20
Hill, R.	Highton	23
Hill, W.	Ceres	25
Hill, W.	Somerton	70
Hinchcliff Bros.	Whittington	74
Hobbs Bros.	Heidelberg	57
Hobbs, Mrs. F. J.	Doncaster	6
Hocking, A. R.	Canadian	12
Hoctor, J. and Son	Greenvale	22
Hodge, E. G.	Junorton	22
Hodgins, J.	Alfredton	2
Hogan, Miss M.	Cambrian Hill	16
Hogan, M.	East Preston	58
Hollier, A. H.	Yarragon	16
Hooper, A.	Moolap	15
Hooper, W. R., jun.	Mickleham	2
Hose, W. J.	Grovedale	33
Houlahan, P.	Eppalock	36
Houlahan, T. J.	Eppalock	43
Howden, W.	Coburg	70
Howe, D. J., V. A., and G. S.	Yarragon	30
Huggins, R. E.	Ballarat	1
Hughes, Mrs. R. E.	Ballarat East	14
Hurrey, T. H.	Yan Yean	44
Hutchinson, J. B.	Drysdale	23
Hynes Bros.	Grant-street, Sebastopol	8
Ireland, C. E.	Yarragon	17
Irish, E. B.	Napoleons	19
Jackson, A.	Glenroy	51
Jackson, Mrs. M. A.	Heidelberg	7
Jackson, J.	South Warrnambool	3
Janefield Farm	Bundoora	43
Jeffrey, J. T.	Mernda	100
Jenkins, Mrs. A.	Mount Rowan	22
Jenkins. T. H.	Whittlesea	20
Jennings, W.	Barwon Heads	46
Jinks, J.	Curlewis	43
Johns, A.	Highton	34
Johnstone, Miss J. A.	Mernda	9
Jolly, Miss P.	Epping	55
Jones, A. J.	South Morang	37
Jones, I.	Lovely Banks	43
Jones, S. E.	Campbellfield	19
Jones, S. G.	Epsom	18
Jones, W. E.	Sebastopol	43
Jukes, C.	Epping	42
Jukes, W. H.	South Morang	38
Junor, G. M.	South Morang	69
Kane, F. E.	Warrnambool	28

Name.	Address.	Number in Herd at Last Test.
Kell, W. E.	Greensborough	23
Kempton, C. J.	Highton	13
Kerr, J.	Mandurang	7
Kerwin, H. E.	Eaglehawk	25
Kilpatrick, E.	Mernda	69
Kilpatrick, Mrs. E. J.	Campbellfield	42
Kinnersley, F. and Son	Wendouree	19
Kirkwood, S.	Eaglehawk	12
Knight, Bros.	White Hills	31
Knight, G. A.	Sebastopol	29
Knowles, J. T.	Ballarat	3
Lacy, G. C. and Son	Cambrian Hill	22
Lacy, N. C.	Cambrian Hill	20
Langdon, C. W.	Barwon Heads	27
Lanning, W.	Moolap	17
Laskey, A. J.	Yarragon	24
Latta, Mrs. G.	Warrnambool	5
Lawry Bros.	Tandara	117
Lay, P.	Alphington	35
Lee, Mrs. E.	Craigieburn	51
Lehmann, A. H.	Epping	39
Lemin, F.	Waurn Ponds	33
Leviston, A. E.	Ballarat East	25
Leviston, G.	Ballarat East	9
Lewis Bros.	Beveridge	58
Lincoln, Mrs. L. M.	Portarlington	58
Littlejohn, E.	Grovedale	22
Lloyd, W. M.	Mickleham	7
Lobb, J. C.	Mickleham	3
Lodington, Mrs. I. E. M.	Ballarat	8
Long, H S.	Dingee	89
Long, J. D.	Epping	70
Longuehaye Bros.	Point Lonsdale	32
Love, C. C.	Warrnambool	48
Love, J. E.	Strathfieldsaye	16
McAllister, K.	Whittington	36
Mackie, F. K.	Yarragon	63
McConachy, E. T.	Highton	33
McCormack, D.	Woodstock	39
McCormick, T.	Geelong West	24
McCulloch, Mrs. A.	Warrnambool	33
McDonald, F.	Queenscliff	63
McDonald, Mrs. M.	Belmont	14
McDonald, N.	Highton	21
McDonald, R. R.	Mannerim	18
McEncroe Bros.	Bendigo	6
McGregor, W. B.	Mernda	39
McKay, A. B.	Coburg	95
McKay, L.	Kal Kallo	14
McKay, Miss E.	Donnybrook	51
McKay, Mrs. H. E.	Ballarat South	10
McKenzie, D. I.	Marong	95
McKinney, K. J.	Kangaroo Ground	33
McLean, J. F.	Bundoora	24
McManus, D. J.	Napoleons	30
McManus, J. W.	Napoleons	20
McMurray, P. J.	South Morang	36
McNabb Bros.	Tullamarine	95
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Maddern, R.	Bell Post Hill	50
Mahood, J. E.	Purnim	113
Malcolm, W.	Drysdale	31
Mann, A. T.	Epping	56
Mannes, W.	Strathfieldsaye	56
Marrinon, R. and Son	Campbellfield	39
Martin, A.	Mt. Rowan	19
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Martin, W. B.	Ballarat	20
Mashiter, T. R.	Greenvale	57
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Mason, Alfred	Wollert	85
Mason, R.	Donnybrook	50
Mathews, Mrs. E.	Ballarat East	8
Mathieson, A.	Whittington G.	25
Matthews, Mrs. E. S.	Heidelberg	11
Matthey, A. J.	Bannockburn	111
Maxwell, J.	Whittlesea	33
Melling, T.	Kennington	15
Menhennett, F. W.	Sebastopol	25
Mercer, H.	Long Gully	21
Meredith, W. J.	Bundoora	68
Meyer, N. R.	Wallan	62
Mill Bros.	Axedale	48

Name.	Address.	Number in Herd at Last Test.
Mill, Mrs. L. M.	Sebastopol	5
Millar, Mrs. G.	Smythe's Creek	51
Miller, A. J.	Whittlesea North	37
Miller Bros.	Greensborough	45
Miller, D.	Epping	49
Moller, C.	Wallington	33
Moller, H.	Leopold	38
Moore, R. G.	Moolap	23
Morris, C.	Sebastopol	28
Morris, E. J.	Huntly	25
Mosig, H. C.	Epping	23
Munro, M. J.	Leopold	20
Murfet, Mrs. S.	Huntly	21
Nankervis, L.	Mandurang	15
Nash, A.	Corio	44
Nash, H. A.	Tullamarine	42
Nebel, Mrs. A. E.	Thomastown	39
Nelson, A.	Donnybrook	78
Nelson, D.	Highton	58
Nestor Bros.	Wendouree	40
New, G. H.	Craigieburn	15
Nickols Bros.	Tandara	76
Nolan, G.	Riddell	78
Noonan, J.	Sedgwick	50
Norton, J.	Yarragon	10
Norton, O. G.	Bundoora	40
Notman, J.	Reservoir	68
O'Brien, Miss K.	Heidelberg	68
O'Dell, J. E.	Ballarat East	21
O'Donnell, P.	Wendouree	38
O'Gorman, A.	Craigieburn	46
O'Halloran, J.	Sebastopol	32
O'Halloran, W. P.	Redan	32
O'Hern, T.	Epping	48
Oliver, E. J.	Mickleham	37
Oliver, W.	Campbellfield	86
Olliver, Mrs. S. E.	Ballarat	14
O'Loughlin, W. L.	South Morang	25
O'Neill, E.	Yarragon	54
O'Toole Bros.	Yarragon	107
O'Toole, T. J.	Yarragon	10
Padovan, J.	Yarragon	23
Page, F. J.	Mount Rowan	38
Panozzo, Mrs. C.	Yarragon	92
Parker, Mrs. A. E.	Greensborough	55
Parker, R. H.	Craigieburn	91
Partridge, F.	Harcourt North	21
Pascoe, Mrs. W. J.	Glenroy	2
Pate, J.	Werribee South	38
Patullo, F. E.	Mickleham	27
Payne, A.	Tullamarine	23
Pearce, A. E.	Mandurang	55
Pearce, J.	Mandurang	23
Peck, F. J.	Sydenham	60
Peel, A. L.	Drysdale	16
Pegg, W. E.	East Geelong	6
Pellas, C. J. H.	Harcourt	10
Pentland, E.	Malden Gully	8
Pentland, F. C.	Marong	26
Petersen, G.	Reservoir	27
Pettitt Bros.	Geelong	27
Phillipe, R.	Werribee South	21
Phillips, E.	Mt. Pleasant	18
Phipps, G.	Point Lonsdale	14
Pigdon, B. A.	Waurn Ponds	55
Pilcher, W.	Kangaroo Flat	6
Pitson, R. H.	Yarrambat	20
Pointer, F. A.	Upper Plenty	43
Polly, J. S.	Grovedale	26
Pope, W. R. E.	Whittlesea	29
Port, A.	Moolap	44
Portingale, J.	Campbellfield	33
Power, L. J.	Mernda	58
Putt, Mrs. D.	Bellarine	22
Pryor, L.	Kangaroo Ground	32
Quinlan Bros.	Epping	48
Rainey, W.	Thomastown	20
Ramage, J.	Mt. Pleasant	28
Rankin, J. W.	Yarragon	43
Rawlings, J. H.	Whittlesea North	37
Rechenberg, J.	Marshall	49
Reddish, Geo.	Coburg	11
Reeves, C. and Son	Sebastopol	19
Renfrey Bros.	Drysdale	11
Renfrey, R. R.	Bellarine	22
Renkin, R.	Ballarat East	11
Reynolds, J. C.	Bolinda	41
Reynolds, Misses	Yarragon	15
Richards Bros.	Leopold	56
Richards, T.	Ballarat	29
Richards, W. J.	Warrenheip	20
Richardson, C.	Curlewis	45
Richardson, D.	Lepoold	23
Richen Bros.	Moolap	47
Ricketts, A.	Mount Duneed	29
Ridsdale, Mrs. M. M.	Yarragon	30
Riley, P.	Curlewis	50
Roberts, A.	Junorton	18
Robinson, J. H.	Fawkner North	42
Robson, Mrs. G. A.	South Morang	52
Rodger, T. B.	Waurn Ponds	26
Rodgers, E.	Whittlesea North	16
Rosewarne, Miss P.	Yan Yean	46
Ross, A.	Lower Templestowe	18
Rowe, Mrs. M.	Eaglehawk	27
Ruff, A.	White Hills	14
Rumpf, D.	Fyansford	13
Sacred Heart Convent	Ballarat	14
Salathiel, R. W.	Big Hill	15
Salau, E.	Strathfieldsaye	12
Sandland, A. W.	Bundoora	30
Scarce, F. W.	Sydenham	32
Scheuffele, C.	Epsom	12
Schreenan, E. and Son	Sebastopol	73
Schultz, L. R.	Wollert	37
Scott, C. M.	Diamond Creek	43
Scott, G.	Connewarre	25
Scott, Mrs. J. M.	Whittington	118
Scott, R.	Marshall	97
Searle, G.	Ballarat	20
Seeber, B.	Thomastown	20
Semmens, J. H.	Sedgwick	13
Sewell, J.	South Morang	31
Shankland, I. D.	Greenvale	13
Sharp, Mrs. John	Whittington	31
Shaw-Logan, T.	Glenroy	124
Sheahan, J.	Templestowe	18
Shearer, G.	Warrenheip	18
Shearer, J.	Warrenheip	11
Siebel, F.	Thomastown	29
Simmons, Mrs. A. E.	Kennington	4
Simpson, N.	Warragon	35
Slorach, J.	Whittlsea	29
Smirfitt, J. E.	Epping	63
Smith, A.	Fawkner North	10
Smith, A. T.	Sydenham	21
Smith, H. H.	Heidelberg	30
Smith, J. R.	Mernda	32
Smith, L. W. W.	Bundoora	73
Smith, R. A.	Epping	35
Smith, S. E.	Epping	27
Smith and Mogensen	Yarragon	100
Sobey Bros.	Napoleons	72
Somerville, A.	Strathfieldsaye	34
Somerville, J.	Strathfieldsaye	31
Somerville, M.	Strathfieldsaye	11
Somerville, P.	Strathfieldsaye	31
Somerville, Wm.	Emu Creek	16
Southon, H. W.	South Morang	40
Spedding, Mrs. S. A.	Ballarat North	5
Spencer, C. H.	Connewarre	29
Spruzen, G.	Wollert	38
Stacey, H. W.	Connewarre	60
Stacey, R.	Warrenheip	29
St. Aidan's Orphanage	Bendigo	14
Stenning, R., Estate of	Wollert	34
Stephens, H.	Epping	46
Stevenson, E.	Wendouree	35
Stimson, T.	Woodstock	30
Stokes, A. R.	Belmont	14
Story, A. E.	Emu Creek	45
Story, T.	Mandurang	24
Stow, J.	Barwon Heads	16
Stringer, R.	Mickleham	4
Stuart, W. A.	Black Hill	3
Studleigh Estates	Greenvale	115
Suffers, M.	Golden Square	17
Sunderland, W.	Highton	28
Swanton, Mrs. C.	Invermay	41
Symons, Estate of J.	Marong	41
Synot, C.	Fyansford	55
Tackaberry, M.	Yarragon	21
Tait, J. M.	Barwon Heads	13
Taylor, W. C.	Ceres	20

Name.	Address.	Number in Herd at Last Test.
Thomas, Mrs. E.	Broadmeadows	14
Thomas, J.	Mandurang	23
Thomas, Mrs. V. E.	Yan Yean	17
Thompson Bros.	Connewarre	21
Thompson, W. B.	Moolap	93
Thurl, A. E.	Yarragon	34
Toman, Mrs. A.	Golden Square	15
Tomkins, Mrs. E.	Moolap West	19
Toshack, H. J.	Wendouree	38
Thompson, A. E.	Sebastopol	3
Thompson, H.	Whittington	35
Towt, C. W.	Glenvale	147
Trahair, R.	Malden Gully	44
Trethowan, F. W.	Donnybrook	65
Trigg, Mrs. A.	Breakwater	20
Troutbeck, H. B.	Mickleham	39
Tuddenham, F. T.	Cherry Tree	19
Tuddenham, M. J.	Cherry Tree	36
Twigg, G. E.	Tandara	37
Twomey, A.	Greenvale	38
Tyack, N. P.	Marcus	58
Tyrell, H. S.	Highton	29
Tyrell, S. T.	Yarragon	81
Underwood, V. D.	Alphington	13
U'Ben	Campbellfield	41
Vallence, C. A.	Epping	21
Vearing, E.	Epping	6
Vernon Estate	Cherry Tree	46
Vickers, J.	Warrnambool	5
Vincent, Mrs. A.	Warrenheip	19
Wallace, R.	Breakwater	24
Wall and Faulkner	Marshall	77
Waller, R.	Ballarat	26
Walsh, B.	North Geelong	39
Walsh, C. J.	Yan Yean	7
Walton, J. C.	Windermere	28
Warner, K.	Batesford	33
Warren, E. and T.	Moolap West	36
Warren, S.	Moolap West	26
Watkins, F.	Campbellfield	40
Watson, Miss M.	Napoleons	8
Wells, A.	Napoleons	16
Wheeler, W. A.	South Morang	31
Whelpton, B.	Whittlesea North	60
White, A. J.	Yarragon	40
White, L. and S.	Alfredton	53
White, T. L. R.	Alfredton	53
White, W. H.	Ballarat West	17
White, W. H.	Smythe's Creek	57
White, W. J.	Alfredton	18
Whitelock, E. A. and E. J.	Epsom	31
Whitfield, A. E.	Bendigo	6
Whitten, R.	East Preston	74
Whittingham, E. W.	Greensborough	15
Wicks, C.	Golden Square	15
Wiffin, W.	Bellarine	54
Wightman, A. A.	Ballarat East	11
Wignell, A. C.	Heidelberg	19
Williams, E.	Thomastown	35
Williamson, T. A.	Glenroy	58
Williams and Berryman	Bendigo	15
Williams, V. K.	Kangaroo Ground	42
Williamson, E. H.	Batesford	39
Williamson, H.	Greenvale	24
Williamson, J.	Doncaster (High-street)	3
Williamson, T. C.	Doncaster	79
Willis Bros.	Craigieburn	55
Wills, R. G.	North Geelong	23
Wilson, J. E.	Diamond Creek	11
Wilson, J. H.	Eltham	3
Wirth, Miss M. O.	Templestowe	15
Wolter, H. G.	Curlewis	39
Wood, A. V.	Yan Yean	159
Wrest, W.	Epping	93
Wright, T.	Tullamarine	41
Yann, R.	Wollert	41
Young, A.	Queenscliff	18
Young, L. C.	Wollert	28
Young, J. A.	Sedgwick	39
Young, Mrs. A.	Wollert	34
Young, R. L.	Wollert	26
Young, T. F.	Drysdale	27
Young, W. S.	Sedgwick	40
Zemancheff, V. G.	Craigieburn	86
Ziebell, H.	Thomastown	38

In addition to the above herds, there are 1,485 head of cattle on 271 properties supplying milk to Benalla Wangaratta, Rutherglen, and Yea that have passed two successive negative tests.

There are also 310 herds in which 10,674 head of cattle have passed one test, and may be considered therefore, to be in process of becoming tubercle-free herds.

SWINE DYSENTERY

Swine dysentery is now one of the diseases listed under the *Swine Act* which allows compensation for pigs slaughtered by order of the Stock Inspector.

In early cases of swine dysentery the owner may report death of pigs suffering from diarrhoea with blood and mucous discharge from the bowel. There may be a sudden loss of condition and pigs may appear dull although the appetite may remain fairly normal. As the disease progresses in a piggery a percentage of pigs may recover, but are likely to remain as carriers for some time, thus acting as a source of infection to other pigs on the farm.

The highly infectious nature of the bowel discharges makes essential a strict quarantine and attention to sanitation. Affected pigs should not be placed in pens adjacent to unaffected pigs as the infection in the droppings may be readily transferred.

Suspected cases of swine dysentery should be reported to the District Veterinary Officer, or the Local Stock Inspector for advice on control measures.

[Contributed by the Live Stock Division.]

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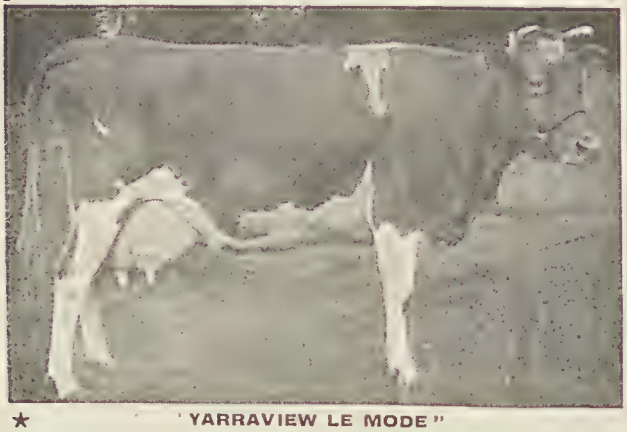

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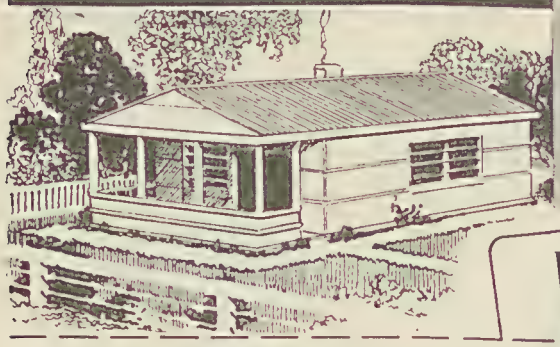

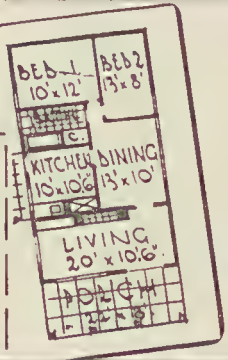

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Trees around the Homestead

By K. V. M. FERGUSON, M.A., B.Sc., Silvicultural Officer, Forests Commission

PARTLY through the medium of a sustained educational campaign over a long period of years, and partly as a result of practical experience, there is gradually developing in the farming community in Victoria an almost universal recognition that judicious planting of trees on farms contributes materially to the realization of a sound farm economy. Many farmers in all parts of the State are now showing a keen interest in cultivating tree crops to improve the value and utility of their holdings, more particularly as it is thereby possible to convert to a useful and productive asset the patches of otherwise unproductive or low-utility land which are to be found on most farm properties.

There are numerous advantages to be derived from the establishment and maintenance of trees on the farm—protection of stock, crops, and buildings, from wind and sun; the supply of timber for use or for sale; the correction of soil erosion; and the beautification of the home surroundings. These values, being to a large extent of an indirect nature, are difficult to assess in terms of money, but nevertheless are very real. It is not the purpose of this article, however, to discuss the subject from this angle. Rather, it is proposed to concentrate attention on one particular aspect—the value of trees planted around the homestead and farm buildings—and to offer suggestions as to suitable species for different localities and hints on planting and tending.

Trees around the homestead serve two main purposes—the provision of shelter and shade, and beautification. Cold wet winds in winter and hot drying winds in summer are liable to be experienced in any year in Victoria, and their effect is felt particularly on plain country where a large proportion of Victorian farm properties is located. The trying effects of these winds on man and beast alike, and the deterioration which they tend to accelerate in buildings, can be greatly reduced by the provision of some form of shelter. Trees make a very effective type of shelter and have the added advantage of being decorative.

The garden and orchard, which are an integral part of the well-managed farm, benefit greatly from such shelter, which minimizes direct loss of production through mechanical damage by wind and counteracts the drying effect of wind on the soil.

The provision of shade from the hot summer sun is just as essential as protection against wind. There are obvious advantages to be derived from the shading of buildings, and it is just as important to afford some protection from the sun to such necessities as fowl runs, pig-pens, horse-yards, and similar enclosures which are part of the farm unit. No one can have failed to observe how animals of all kinds eagerly seek the protection of any available shade on

A Gippsland farmhouse snug behind its shelter of trees and shrubs.

a hot day, and attention to the comfort of stock will repay handsome dividends in healthy animals and increased yields.

However, probably even more important than these considerations is the fact that the shade and shelter of trees provide more congenial living conditions for the farmer and his family. A bare and treeless homestead is cheerless and uninviting at any time of the year and it is wonderful what a difference can be effected by a few trees, which in addition to their protective value are pleasing to the eye. Should the owner be desirous at any time of disposing of his property, its market value will be greatly enhanced and the property made more attractive to prospective purchasers.

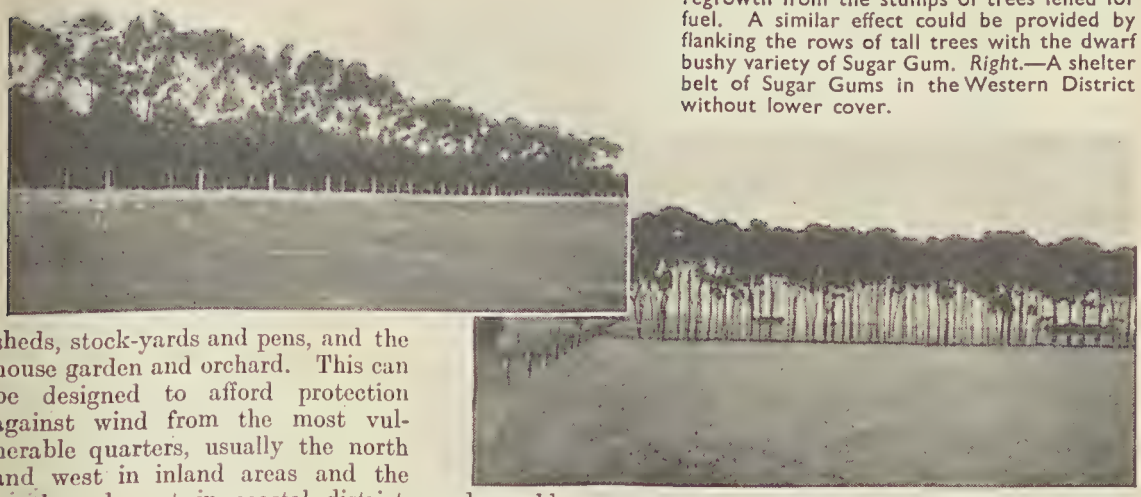
Choice of the best species to plant is always a problem for the farmer. The main points to be observed are that the tree should be suitable for the purpose for which it is required and that there should be reasonable certainty of its thriving in the particular environment in which it is to be grown.

Natural factors such as drainage, rainfall, soil structure, frost incidence and exposure, all have an important bearing in relation to a tree's successful development, and each species has its own particular requirements. These conditions vary between very wide limits in this State, and a species which is hardy and reliable in one district may be an utter failure in another. Some trees are susceptible to frost damage, others cannot thrive in a hot, dry climate such as is characteristic of north-western Victoria; some are unable to withstand coastal exposure, and few trees can tolerate badly drained soils. A knowledge of the characteristics and requirements of each species is thus important if failures are to be obviated. Nothing is more calculated to discourage than to see time and labour wasted by failure of planted trees either to become established or to make healthy growth. Disappointing losses can usually be avoided by a judicious choice of species in the first place, and anyone in doubt would, therefore, be well advised to ask expert advice.

Windbreak for the Homestead and Farm Buildings

Before discussing specific recommendations for different localities, a word is given regarding the general arrangement of plantings. It is usually a good idea to establish a wind-break for general protection of the farm unit comprising house, outbuildings such as barns, stables, and implement

A few trees and shrubs would have added considerably to the attractions of this little farmhouse, not to mention the comfort of the occupants.



Left.—A shelter belt of tall Sugar Gums with dense lower cover provided by coppice regrowth from the stumps of trees felled for fuel. A similar effect could be provided by flanking the rows of tall trees with the dwarf bushy variety of Sugar Gum. *Right.*—A shelter belt of Sugar Gums in the Western District without lower cover.

sheds, stock-yards and pens, and the house garden and orchard. This can be designed to afford protection against wind from the most vulnerable quarters, usually the north and west in inland areas and the south and west in coastal districts, and would consist of a reasonably dense and tall shelter-belt composed of a hardy species which can be depended upon to thrive in the particular locality. This protective belt will be supplemented by such additional low wind-breaks, hedges, or shade trees as may be required for the further protection of individual features such as the orchard, and a selection of species for ornamentation. Incidentally, the shelter provided by the main windbreak will permit a wider choice of species to be made and grown successfully.

In the space of a short article it is not possible to discuss in detail the species most suitable for planting in different regions and only a general approach will be attempted.

As windbreak trees, the cypresses are ideal. Planted in single or double rows they provide excellent shelter, are relatively quick growers, are hardy, and can be lopped or trimmed if required. They will thrive in all parts of the State except in very hot and dry districts. The *Lambertiana* and *Macrocarpa* varieties are suitable for general

Native Pine (*Callitris glauca*) provides shade for horses and protection for stable at the Mallee Research Station, Walpeup.

Welcome shade is provided by these wide-spreading bushy trees.

planting, the Arizona Cypress (*Cupressus Arizonica*) for warmer localities, and other varieties for the cooler and moister districts.

Insignis Pine (*Pinus radiata*) is another hardy, fast grower for planting in areas with over 25 inch rainfall. It provides good shelter besides producing marketable timber.

Sugar Gum (*Euc. cladocalyx*) is a reliable species for all except the wetter and colder parts of the State, and is particularly suited for growing on the plain country of western, northern, and north-western Victoria. It is a fast grower, will withstand drought, and produces a useful timber. Its habit of growth, with the absence of lower limbs on the trunk, is a disadvantage from the point of view of effective shelter, but this may be offset in various ways. The trees can be grown in plantations half a chain or more in width rather than in rows, and underplanted with a low-growing species such as the Golden Wattle (*Acacia pycnantha*)—this is common practice in the Western District where Sugar Gum is widely cultivated for shelter purposes. Alternatively, rows of tall Sugar Gums may be interplanted with the dwarf, bushy type (*Euc. cladocalyx* var. *nana*) which is now available and which carries its green branches practically to ground level. Another practice adopted is to pollard or coppice the trees at any desired height to induce more bushy growth.

Yate Gum (*Euc. cornuta*) may be planted in lieu of Sugar Gum as it has a similar growth habit and requires practically the same conditions. Bushy Yate (*Euc. Lehmanni*) is a low-branching variety similar to Bushy Sugar Gum.

In cooler lowland districts with moist soils the Mahogany Gum (*Euc. botryoides*) is preferred to Sugar Gum and makes a very effective shelter belt.

In the arid north-western parts of the State where irrigation water is not available, the most reliable species is the Pepper Tree (*Schinus molle*). Admittedly it is a soil robber, but it grows

Compare this treeless paddock with the one pictured above.

quickly, gives excellent shelter, will stand topping, and is extremely drought resistant.

Another species which can be planted in hot, dry localities is the Athel Tree (*Tamarix aphylla*) which is reputed to be a fast grower and to give effective shelter. Little information on the growth of this tree in Victoria is yet available, however.

In the establishment of a shelter belt, it is wise to pin faith to species of proved reliability. Within this general protection, greater latitude in selecting species may be permitted. In the vicinity of the homestead, subsidiary protection belts in the form of low windbreaks and hedges are usually sufficient. For the warmer inland districts Cootamundra Wattle (*Acacia Baileyana*), Pepper Tree (*Schinus molle*), Pincushion Hakea (*Hakea laurina*), Osage Orange (*Maclura pomifera*), Olive (*Olea europoea*), Boobialla (*Myoporum insulare*), and Tamarisk (*Tamarix gallica*) are suggested; for the cooler lowlands and foothills Pittosporum (various species), Privet (*Ligustrum vulgare*), Hawthorn (*Crataegus oxyacantha*), Irish Strawberry (*Arbutus unedo*), Tree Lucerne (*Cytisus proliferus*) and Chinese Hawthorn (*Photinia serrulata*); for cold mountain climates Holly (*Ilex aquifolium*); and for coastal localities Tea Tree (*Leptospermum laevigatum*), Boobialla (*Myoporum insulare*), and Looking-glass Plant (*Coprosma lucida*).

Shade Trees

On the subject of summer shade trees, it is difficult to particularize as all trees provide shade. A good shade tree should be wind-firm with a dense, spreading crown. Deciduous trees are amongst the best and the fact that their leaves are dropped in winter, thus admitting air and sunlight, is often an advantage rather than the reverse. In this category various species of Elm, Poplar, Weeping Willow, Oak, Plane, Linden, Horse Chestnut and Ash may be mentioned, but these thrive best in cool districts as do the evergreen conifers—Pines, Cedars, and Cypresses—which are also good shade trees. All of these are also quite attractive in appearance. For warmer climates the Queensland White Cedar (*Melia azederach*), Kurrajong (*Brachychiton populneus*), Sugar Gum, Jacaranda, Pyramid Tree (*Lagunaria Patersoni*), Cape Chestnut (*Calodendron capense*), and Native Pine (*Callitris glauca*) are recommended. Most of these are evergreen trees.

Shade trees may be planted as single specimens or in clumps. They should not be set too close together as spread of crown is a desirable feature.

Decorative Trees

For planting in the immediate vicinity of the homestead itself, primarily for decorative effect, a wide range of trees is available for selection and most of them can with care be grown successfully under all except the most exacting conditions. Usually it is possible to give such trees individual treatment in the way of watering, staking, mulching and shading, and any tree will respond to careful tending especially in the young stages. If it is possible to give young plants this attention, many of the less hardy trees and shrubs can be reared even in localities not altogether naturally

Well-placed trees and shelter belts have improved the appearance of this Western District property and provide adequate shelter for stock.

[Photo. H. C. F. Morant

favorable for their best development. Of course, climatic conditions impose some limitation—for instance, it would be waste of time and effort to attempt to grow species such as the Scarlet Oaks, Rowan Tree, Japanese Maple, Holly, and similar cold country types in the Mallee, and conversely frost tender varieties like Jacaranda or Kurrajong in a cold mountain locality.

There are many handsome flowering trees, both deciduous and evergreen, which can be cultivated without much trouble. Many of the West Australian flowering gums are included in this category and are suitable subjects for planting in the warm to hot inland districts. None of them grow to a size too large to be accommodated in the average home garden surroundings. The Cape Chestnut, Jacaranda and Silky Oak (*Grevillea robusta*) are other fine flowering species for similar conditions.

The native Wattles form another group of ornamental trees or large shrubs suitable for garden planting. They can be cultivated in practically any part of the State although it should be mentioned that many of them, the Golden Wattle (*Acacia pycnantha*) for example, are subject to damage by frost.

For the colder districts in the hill country, a number of deciduous species prized for their bright green spring foliage and vividly tinted autumn leaves can be cultivated and these deserve special mention. Such species, however, are not particularly suited to the warmer and drier localities as the foliage tends to burn and the autumn decorative effect is lost. The Scarlet Oaks, Liquidambar, Tulip Tree (*Liriodendron*) Maples, Claret Ash, Rowan Tree, and Aspen are familiar examples in this class.

Trees grown for their ornamental qualities must be given ample room for development so that they will show to maximum advantage. It is a common fault to plant them too closely together—remember that trees which at time of planting are set at what appears to be a reasonably wide distance apart, say 10 to 15 feet, may in ten years' time have a crown span of 20 feet or more. For this reason it is necessary to have some knowledge of the growth habit of the different species in order to avoid the later development of misshapen and lop-sided crowns which result from overcrowding and which detract from a tree's appearance.

Some Points to Remember

Two other points to be borne in mind when contemplating tree-planting near the homestead, are :—take care that trees are not planted where roots will interfere with drains and building foundations, (Poplars and Elms are particularly liable to cause damage on account of their wide-spreading and very strong root systems) and plant with an eye to the position of telephone and other overhead wires so that when the trees grow it will not be necessary to mutilate the crowns by lopping, so destroying the tree's symmetry.

If it is worth growing trees, it is worth doing the job properly. As mentioned above, it is very disappointing to go to the trouble of preparing the ground, purchasing seedlings, and planting the young trees only to find that they either fail to become established or make unthrifty growth. Extra care at planting time and during the first year or two thereafter will well repay the time and trouble involved and yield more certain and satisfying results.

Space does not permit of a detailed discussion of planting and tending methods, but a few hints on the more important precautions which should be observed may be of assistance to the amateur planter.

1. Young plants must be protected against damage by domestic stock and rabbits. Wire-netting stock-proof fencing should be erected or alternatively strong tree guards for individual plants.

2. Use strong plants with a good root system, and plant only in moist soil and preferably on a dull, windless day. Never permit the plant roots to become dry.

3. Thorough preparatory cultivation of the planting site, and the digging of too large rather than too small pits for the plants, will give the young trees a good start.

4. Stake the young trees firmly at planting time, tying with strips of cloth or canvas in preference to wire or string.

5. Water thoroughly in dry weather, giving each plant a thorough soaking once a week. This treatment should be continued for the first summer or two at least.

6. In dry climates particularly, a good surface mulch of leaf mould, straw, or well-decayed stable manure will help to keep the roots cool and conserve moisture.

7. Keep down weeds by hoeing until the plant is well established.

(*Continued on page 212*)

THISTLES

Identification and Control

By A. MORGAN, B.Agr.Sc., District Irrigation Officer

A prolific growth of Spotted or Milk Thistles near Rochester.

UNDER the *Vermin and Noxious Weeds Act* 1928, eleven species of thistle are proclaimed for the State, while eight additional species are proclaimed within certain municipalities. Four more thistles occur fairly commonly, but are not considered weeds of major importance, and there are species naturalized in South Australia and New South Wales which will in all probability soon be found in Victoria.

The problem of noxious weeds is becoming an increasingly important one in all branches of farming, and the development of large-scale transportation methods unfortunately favours the rapid distribution of pests. No really *cheap* and *effective* herbicide such as is necessary for weed control *on a large scale* has been produced, and, until such a chemical is discovered, the problem of weed control must rest on a preventive rather than a curative basis, except where improved cultural methods are found effective. The first essential in the preventive campaign is the ability of the farmer to recognize the noxious plant before it has obtained a firm footing on his property. The following key for the identification of the thistles at present recorded in the southern States, when used in conjunction with the short non-technical descriptions given, and the illustrations, will enable any person without previous botanical knowledge to determine the name and importance of any thistle. The key is based on the colour of the flowers, presence or absence of prickles or spines on the leaves and so on—characters which can be determined at a glance, yet do not vary to any great extent with local conditions.

In a few cases it is necessary to refer to the (usually) leathery, spiny organs, known as bracts, which enclose the large number of small flowers, the whole forming the characteristic thistle flower-head. One of these may be pulled off easily from the head and its nature recognized without the aid of a lens. Note carefully that it is the colour of the *flowers inside the head* that

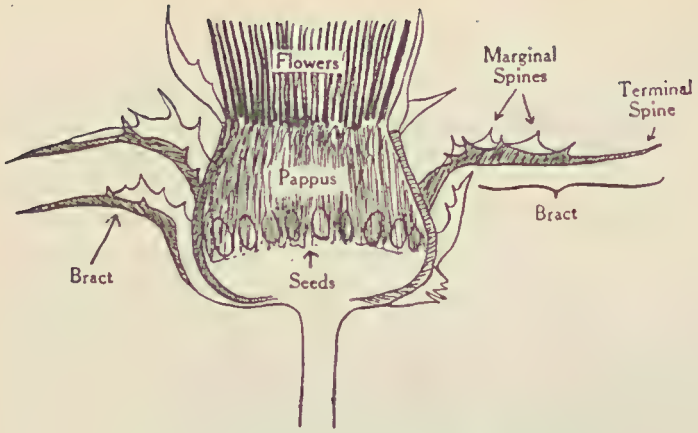


Fig. 1. Section of typical thistle flower-head.

is referred o in the key, not the colour of the bracts which form the outer covering of the head.

KEY FOR THE IDENTIFICATION OF THISTLES (IN FLOWER).

1. Plant stemless, with flowerheads set in rosette of leaves on the ground— *See* STEMLESS THISTLE
   Plant with stem; heads along or at end of branch .. .. *See* 2
2. Leaves variegated .. .. .. *See* 3
   Leaves not variegated .. .. *See* 4
3. Flowers purple *See* SPOTTED THISTLE
   Flowers yellow *See* GOLDEN THISTLE
4. Flowers yellow or orange .. *See* 5
   Flowers purple, blue, pink, or white *See* 10
5. (*Flowers Yellow or Orange*)—
   Flowers orange, plant not hairy or woolly .. *See* SAFFLOWER
   Flowers yellow .. *See* 6
6. Leaves spiny or prickly, stems not winged .. .. .. *See* 7
   Leaves not spiny or prickly, stems winged .. .. *See* 8
7. Flower head visible .. *See* 9
   Flower head not visible, being enclosed by thin green leaves; bracts narrow and comb-like because of large number of close-set spines along the margins (See Fig. 2, 7); *See* BLESSED THISTLE
8. Spines of outer bracts arranged like the fingers of the hand; middle one long and yellow— (See Fig. 2, 4); *See* ST. BARNABY'S THISTLE
   Spines of outer bracts arranged like backbone of a fish; middle one short and reddish— (See Fig. 2, 3); *See* MALTA THISTLE
9. Bracts stiff, with 4 or 5 spines along each edge— (See Fig. 2, 2); *See* SAFFRON THISTLE
   Bracts with 2 or 3 small fine spines on each edge, close-set near the base— (See Fig. 2, 18); *See* AFRICAN THISTLE
   Bracts leafy, broad, pointed, with numerous small spines along each edge OX-TONGUE

Fig. 2. Bracts of various thistles showing shape and arrangement of spines.

10. (*Flowers Purple, Blue, Pink, or White*)—
Flowerheads not spiny .. *See* 11
Flowerheads spiny .. .. *See* 14

11. Flowers blue, bracts with comb-like margins— *See* BLUE CORNFLOWER
Flowers purple or white .. *See* 12

12. Bracts brown to black, with conspicuous fringe— (See Fig. 2, 11); *See* KNAPWEED
Bracts not fringed .. .. *See* 13

13. Lower leaves with long narrow opposite teeth cutting back almost to the mid-rib *See* TERRIBLE WEED
Lower leaves stalkless, with coarse teeth, but the teeth not opposite and not cutting back to near the mid-rib.
Roots black .. *See* HARDHEADS

14. Leaves not prickly or spiny *See* STAR THISTLE
Leaves prickly or spiny .. *See* 15

15. Stems conspicuously winged .. *See* 18
Stems not winged, or winged only for a short distance below each leaf *See* 16

16. Perennial, growing 1 to 2 feet high, with creeping underground roots *See* PERENNIAL THISTLE
Annual or perennial, growing 3 feet or more high, without creeping underground roots .. .. *See* 17

17. Perennial, the heads large, the leaves white— *See* ARTICHOKE THISTLE
Annual, the heads small-medium in size, the leaves green— *See* SYRIAN THISTLE

18. Bracts ending in a branched spine— (See Fig. 2, 9); *See* SOLDIER THISTLE
Bracts ending in a single unbranched spine— (See Fig. 2, 13 to 16); *See* 19

19. Spines of head both orange-coloured and long— *See* SCOTCH THISTLE
Spines of head *not both* orange-coloured and long .. .. *See* 20

20. Bracts woolly .. ..*See* SPEAR THISTLE
Bracts not woolly .. .. .. *See* 21

21. Bracts broad and purplish— *See* ILLYRIAN THISTLE
Bracts narrow and not purplish .. *See* 22

22. Heads globular, clustered; flowers purple— *See* CRISPED THISTLE
Head narrow, clustered; a white-woolly plant; flowers usually pink or white *See* SLENDER THISTLE

Identification of a Specimen

To understand the working of the key for identification more clearly, the following example is given :—

In identifying a thistle from this key, the first thing to be decided is whether the plant is stemless or carrying a stem. If the thistle has a stem, see 2. Are the leaves variegated or not variegated? If they are not variegated, see 4. Are the flowers yellow or orange, or are they purple, blue, pink, or white? If they come within the latter group, see 10.

Fig. 3. Left: Male head of Perennial Thistle; Centre: Female head of same thistle; Right: Head of Crisped Thistle (*Carduus Crispus*).

[Board Agri. & Fish, Leaf. 166.

Are the *flower heads* spiny or not spiny? If they are spiny, see 14. Are the *leaves* prickly or spiny, or are they not? Let us suppose they are, see 15. If on examination it is decided that the stems are not winged, or, if so, only for a short distance below each leaf, see 16.

Finally, the specimen (for example) proves to be a perennial, growing 1 to 2 feet high, with creeping underground roots, and is identified, therefore, as PERENNIAL THISTLE.

DESCRIPTIONS OF THISTLES

Species Proclaimed Noxious for the Whole State

PERENNIAL OR CALIFORNIAN THISTLE.

Other Common Names.—Creeping Thistle, Corn Thistle, Canadian Thistle, Field Thistle, Cursed Thistle, Small-Flowered Thistle.

Botanical Name.—*Cirsium arvense* Scop. (*Cnicus arvensis* L.; *Cnicus arvensis* Hoffm.; *Carduus arvensis* Robs.; *Serratula arvensis* L.; *Carduus arvensis* Taber.)

Heads in branched group topping the stem.
Flowers bright purple, occasionally white.
Bracts narrow, with a single terminal spine.
Leaves vivid-green, clasping the stem slightly at the base, and with coarsely-toothed spiny margins, frequently whitish on the under side.
Stem shows fine line markings along it, and is occasionally shortly winged.

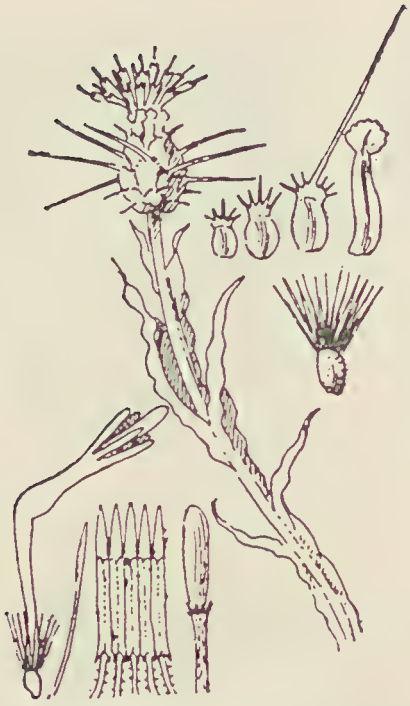


Fig. 4. St. Barnaby's Thistle (*Centaurea solstitialis L.*)
[Flora of Sth. Aust.

This is the most troublesome of the thistles on account of its habit of spreading extensively underground, sending up numerous shoots, so that a single plant soon develops into a large patch without the necessity for seeding.

Because of the peculiarity that two types of flower-head are produced on separate plants, in one of which the majority of the mature seeds occur, "male" and "female" plants are easily distinguished, each type often forming a large separate patch.

Many farmers believe that *all* the seed produced is infertile, but although the amount of fertile seed produced is apparently very low in some seasons, there is always a percentage of seeds which will germinate quite readily in the same year or in the following spring. From the seedling, a thin taproot descends into the soil, and many buds capable of forming new shoots develop along this root and upon the subsequent secondary roots. While the plant is still relatively inconspicuous above-ground, therefore, it has established a considerable rooting system deep into the soil, and, what is more important from the point of view of control by cultivation, any part of the root-system can form a new plant if distributed by implements while the soil is moist *See* Control Measures.

SAFFRON THISTLE (Woolly Star Thistle or False Star Thistle).

Botanical Name.—Carthamus lanatus L. (*Kentrophyllum lanatum* DC., *Kentrophyllum lanatum* Necker).

Heads solitary, set amongst small spiny leaves, elongated.
Flowers bright yellow.
Bracts end in a stiff spine, and have four or five spines along each margin.
Leaves olive-green, stiff, deeply cut into spiny lobes. A form with only slight toothing of the leaf-margin, and with very dull and downy leaves, is fairly common.
Stem not winged.

A downy or hairy annual, usually 1 to 2 feet high.

MALTA THISTLE (Maltese Cockspur).

Botanical Name.—Centaurea melitensis L.

Heads solitary or two to three together, stalkless, arising from among a few leaves at the ends of the branches.
Flowers yellow.
Bracts broad, ending in a short reddish spine, the other spines being arranged along it like the backbone of a fish. (See Fig. 2, No. 3.)
Leaves.—The leaves of the rosette and along the base of the stem are somewhat irregular in outline, but the top leaves have plain margins. Prickles are absent from all leaves.
Stem winged.

This is a rough-hairy annual, 1 to 4 feet high, easily distinguished from St. Barnaby's Thistle by the arrangement of the prickles of the bracts, as shown in Fig. 2, No. 3.

ST. BARNABY'S THISTLE (Yellow Cockspur. Yellow Star Thistle).

Botanical Name.—Centaurea solstitialis L.

Heads solitary, shortly stalked.
Flowers yellow.
Bracts broad, ending in a long yellow spine, with the other spines arranged at its base like the fingers of the hand. (Fig. 2, No. 4.)
Leaves non-prickly, similar to Malta Thistle in shape, the lower leaves being irregular in outline, and the upper leaves with plain margins.
Stem winged.

A stiff, erect, more or less woolly annual, 1 to 2 feet high.

STAR THISTLE (Calthrops).

Botanical Name.—Centaurea calcitrapa L.

Heads solitary, usually stalkless, among a few small leaves.
Flowers purple (or occasionally white).
Bract broad at the base, ending in a long stout yellow spine with 4 to 6 smaller spines along its basal margins. (These latter absent if flowers infertile.

Fig. 5.—Some Common Thistles.

1a—Saffron thistle, 1b—bract of Saffron thistle, 1c—flower of Saffron thistle ; 2a—Flower, seed head, and bracts of Malta thistle, 2b—Malta thistle ; 3a—Star thistle, 3b—Bract of Star thistle ; 4—St. Barnaby's thistle ; 5a and 5b—Artichoke thistle.

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Fig. 6.—Blessed Thistle (*Cnicus benedictus*) showing leaf, flower and head.
[Calif. Mo. Bull. XI.

Leaves.—Except for the small leaves among which the heads are set, the leaves are deeply cut to form narrow paired "leaflets" and are non-prickly.
Stem not winged.

A sparsely hairy or slightly woolly annual or biennial, with a thick taproot. It is profusely branched, and in sandy soil may send out long runners. It grows 1 to 2 feet high.

Artichoke Thistle (Wild Artichoke, Cardoon).

Botanical Name.—Cynara cardunculus L.

Heads solitary, very large, and ornamental when in full bloom. Borne on short stalks.
Flowers purple.
Bracts very broad at the vase, and fleshy; end in a single stout spine. (See Fig. 2, No. 6.)
Leaves white and woolly in appearance, deeply divided into lobes ending in strong yellow spines.
Stem ribbed and winged.

Although a perennial plant, it does not spread by underground roots in the same manner as the Perennial (Californian) Thistle; still, it produces a large number of fertile seeds, and although some small birds eat a large percentage of these while still immature, the spread of the plant can be rapid owing to the wholesale distribution of seeds.

It grows up to 6 feet high, and the spread of the lower leaves is correspondingly large so that the value of a pasture is considerably reduced due to the choking out of other more useful vegetation.

Sacred or Blessed Thistle (Bitter Thistle).

Botanical Name.—Cnicus benedictus L. (*Carbenia benedicta* Adans.).

Heads without stalks, sheathed in the upper leaves.
Flowers yellow.
Bracts narrow, ending in a long spine, with a row of smaller spines, closely spaced along each margin, giving the whole bract a comb-like appearance.
Leaves thin, green, and prickly; the lower ones stalked, the upper leaves with clasping bases; all 3 to 6 inches long, and jagged with unequal teeth. Spiny along the margins.
Stem branching, rather hairy.

An annual which derives its name from its use in medieval medicine.

Syrian Thistle.

Botanical Name.—Cirsium syriacum Gaertn.

Heads large, surrounded by a few narrow spiny leaves.
Flowers purple.
Bracts.—The outer bracts end in a single short unbranched spine.
Leaves irregular in outline, and spiny.
Stem only slightly winged, if at all.

This thistle, which grows 3 to 5 feet high, is similar in some respects to the Perennial Thistle, but on account of its *annual* nature it is not so dreaded as a weed. It does not show the "male" and "female" heads typical of Perennial Thistle.

Fig. 7.—Illyrian Thistle.

ILLYRIAN THISTLE.

Botanical Name.—Onopordon Illyricum L.

Heads of medium size, very shortly stalked, usually solitary, spiny.
Flowers purple.
Bracts purple, broad, ending in a short spine. (See Fig. 2, No. 10.)
Leaves white, woolly, coarsely toothed, with spiny margins.
Stem white, woolly, winged and spiny.

This plant is an erect white-woolly thistle with a strong taproot; although recorded from one locality only, to date, it is known elsewhere as a bad weed, and should be watched for and destroyed. Its proclamation in 1933 as a noxious weed for the State may prevent it gaining ground here.

PURPLISH CORNFLOWER OR TERRIBLE WEED.

Botanical Name.—Centaurea paniculata L.

Heads very small, solitary on the numerous branches, not prickly.
Flowers purple.
Bracts chaffy, with no spines, and no conspicuous fringe or other character.
Leaves small and sparse on the stems. The lower leaves are deeply cut to form narrow teeth, arranged like a fish backbone. There are no spines or prickles present.
Stem rigid, wiry, and cottony.

The head of this perennial plant, although small and devoid of prickles, is definitely of the thistle conformation. As a weed, it is not well known in this State, only a single record of it being made, but it is recorded in Black's "Flora of South Australia" as a recent arrival in that State. Any plant answering to its description should be destroyed at once with a view to preventing its spread in Victoria.

SOLDIER THISTLE.

Botanical Name.—Cirsium Acarna L. Moench. (*Picnomon Acarna* (L.) Cass.)

Heads stalkless, single or 2 to 4 together among several leaves at the end of the branch, these leaves being longer than the head but not concealing it. Heads spiny.
Flowers purple.
Bracts narrow, with a recurved terminal spine bearing 2 to 8 smaller marginal spines; woolly below the spines. (Fig. 2, No. 9.)
Leaves somewhat narrow, white-woolly, the margins cut into lobes ending in long yellow spines, and the remainder of the leaf edge bearing small spines.
Stem stout, erect, winged, spiny.

This plant is recorded as naturalized in certain districts of South Australia, and may find its way into Victoria, where it should be attended to if recognized. Its name indicates its aggressively spiny character. It is a white-woolly annual, related botanically to the ubiquitous Spear Thistle.

Fig. 8.—Slender or Shore Thistle (*C. tenuiflorus Curtis*).
[Flora of Sth. Aust.

Thistles Proclaimed Noxious Weeds within certain Municipalities

SLENDER OR SHORE THISTLE (Corsican Thistle).

Botanical Name.—Carduus pycnocephalus Jacq. (*C. tenuiflorus* Curt.).

Heads rather small, borne in clusters, stalkless, spiny.
Flowers pink, white or purple.
Bracts narrow, ending in a straight or curved unbranched spine.
Leaves prickly, with irregularly lobed-toothed margins, woolly below.
Stems winged and spiny, somewhat woolly.

The Slender Thistle is a stiff, but rather slender annual or biennial, occurring commonly in Victoria, and frequently prominent near the coast. It usually has a cotton-woolly appearance. Professor Ewart gives *C. tenuiflorus.* Curt. as a synonym for *C. pycnocephalus* Jacq in his "Flora of Victoria," while Mr. J. M. Black, in the "Flora of South Australia," gives differences between *C. tenuiflorus* Curt. and *C. pycnocephalus* L. The multiplicity of

generic and specific names for thistles is particularly confusing. The plant is proclaimed for Warrnambool, Port Fairy, Koroit, Bairnsdale, Northcote, Korumburra, Colac (Shire and Borough).

SPOTTED OR MILK THISTLE (Lady's Thistle, Variegated Thistle).

Botanical Name.—Carduus Marianus, L. (*Silybum Marianum* Gaertn.).

Heads large, solitary at the ends of the branches, with conspicuously spreading spines.

Flowers purple.

Bracts stiff and fleshy, spreading or recurved, ending in a stout spine up to 1½ inches long, and with several smaller marginal spines towards the base. (See Fig. 2, 12.)

Leaves.—The first two leaves (cotyledons) produced after germination are not variegated and their margins are plain; all subsequent leaves produced are variegated by white veins on the smooth shining upper surface, and are deeply and irregularly toothed. The leaves are prickly, and along the upper part of the stem they have clasping bases.

Stem not much branched, not winged.

The Spotted Thistle is usually biennial, though sometimes annual, and may grow to 12 feet high. It seeds freely, and large numbers of plants develop, forming a dense impenetrable prickly clump. Apart from this it is not perhaps as objectionable as the other thistles since though spiny it is of a soft herbaceous consistency and makes ensilage of moderate fodder value. The large heads with purple flowers, in conjunction with the variegation of the leaves, are sufficient to identify it. It shows a preference for moist situations. Like Sorghum and Sudan grass, freshly cut plants of Spotted Thistle are poisonous at certain times.

Fig. 9.—Spotted or Milk Thistle.
[Flora of Sth. Aust.

Production of nitrite in the juice of the plant has been observed. Nitrite poisoning produces symptoms similar to those of prussic acid poisoning.

The Spotted Thistle is proclaimed for Colac (Shire and Borough), Koroit, Avon, Belfast, Port Fairy, Heytesbury, Maffra, and Korumburra.

SPEAR THISTLE (often miscalled "Scotch Thistle"—*See* true SCOTCH THISTLE).

Other common names: Black Thistle, False Scotch Thistle, Burr Thistle, Plume Thistle, Bull Thistle.

Botanical Name.—Carduus lanceolatus Scop. (*Cirsium lanceolatum* L.; *Cnicus lanceolatus* Hoffm.).

Heads spiny, medium-sized, very shortly stalked, solitary or two together terminating the branches.

Flowers purple.

Bracts narrow, ending in a single unbranched spine.

(*contined on page 227*)

Cutting Saffron Thistles in Northern Victoria.

Certified Onion Seed

By F. M. READ, M.Agr. Sc., *Chief Inspector of Horticulture*

SINCE 1941 the Department of Agriculture has been certifying onion seed crops at the request of Victorian growers and a list of onion seed growers, together with the varieties of seed grown by them for certification in the 1945-46 season is shown at the conclusion of this article.

For the purpose of certification, bulbs to be planted must be inspected by an officer of the Department of Agriculture and then held in sealed bags until planted under Departmental supervision. The harvesting and the seed-cleaning operations are also supervised, bags being sealed at all the stages, except when seed is being treated under supervision. It is already apparent that the planting of bulbs selected for uniformity and conformity to the type laid down for the variety is sound practice. Test crops sown with certified seed have been found to reproduce substantially the parent type. No special selections of high-quality strains have to date been certified, all lines being classed as "commercial strain." This means that the seed is certified as being high quality commercial seed. The fact that leading onion growers are the main supporters of onion seed certification should be sufficient to convince every onion grower that the practice is desirable. There is a great need, however, to increase the scope of certification and we have a long way to go before every onion grower in Victoria uses certified seed or seed of an equally high standard.

"AUSTRALIAN BROWN"

For practical purposes, we can confine ourselves to a study of the two onion varieties which supply the bulk of our requirements, namely, Australian Brown and Late Brown Globe. The variety, Australian Brown, is recognized throughout the world as the most valuable long-keeping onion in cultivation, but anyone familiar with present-day crops must be disappointed by the great variation in type throughout our crops. Few crops can be regarded as of high quality. So great is this variation that an American authority visiting Australia during the war was quite unable, by observation, to determine just what type we were aiming at. In the United States, the Australian Brown variety has been known for a very long time, and much selection work has been done in California in maintaining the strain at a high level. It is of interest to note that the improved stock seed of this variety released by the California Agricultural Experiment Station in 1932 is identical with the type selected by the Victorian Department of Agriculture as the basis of onion seed certification. It is not yet possible, of course, to select for planting as "commercial strain" bulbs of

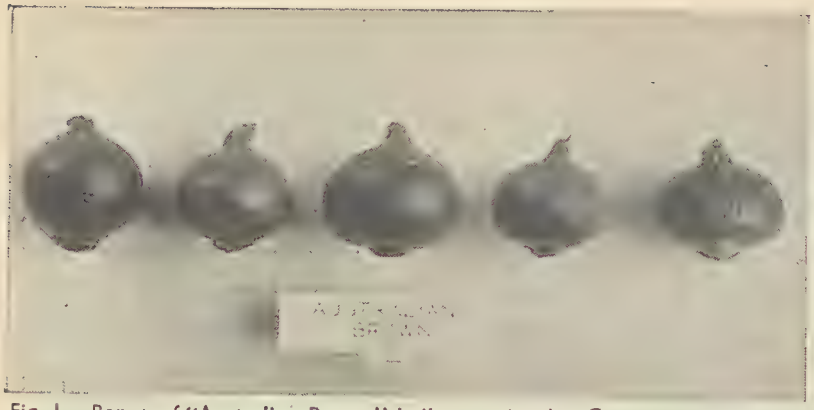

Fig. 1. Range of "Australian Brown" bulbs permitted in Certified "commercial strain". The centre bulb is the best, although the photograph makes it appear a trifle too flat at the base.

exactly the same shape and size, and under the Certification Scheme, a reasonable range is permitted as illustrated in Fig. 1. In this illustration the centre bulb is the most desirable. Fig. 2 illustrates an Australian Brown bulb of ideal form.

In passing, one wonders why the name Brown Spanish is used so widely in Australia, as the Brown Spanish variety is quite distinct, being much flatter and even dished on top, more lightly skinned, and possesses much poorer keeping qualities. The Australian Brown onion, so far as can be gathered from older growers, is a cross between Brown Spanish, Yellow Globe Danvers and Red Rocca. Long keeping is mainly derived from the last-named variety, but too much Red Rocca in the strain gives a red skin and a tough flesh, tinged with red r purple. These characters are not permitted in certified bulbs, which should have at least two sound whole skins of brown colour and a flesh nearly white throughout. Bulbs with coarse thick "necks" or very thin "necks" are also rejected, as are bulbs with stems not centrally placed.

"LATE BROWN GLOBE"

The ideal bulb of the Late Brown Globe variety should be of true globe shape as illustrated in Fig. 3. It should have at least one whole skin of straw colour to brown, and should mature about three weeks earlier than the Australian Brown variety. While the Late Brown Globe should store satisfactorily for three months or so, it will not keep as long as the Australian Brown, which is customarily marketed as late as October. On the other hand, Late Brown Globe can outyield Australian Brown, increase the marketing season by a few weeks, and is an onion of superior quality. There is a definite place in Victorian onion growing for this desirable late mid-season variety, but the truth is that though the name remains and is still given to a lot of onions grown in this State, the true Late Brown Globe is hardly grown at all in Victoria. The vast majority of the crops masquerading under this name consist of onions not very different from the Australian Brown in shape and often not more than a week earlier in maturity. This variety was originally raised by Mr. Andrew Burns of Corrunnun and crops grown by this grower's family to the present day have been kept true to type by proper selection of bulbs for seed production. If Victorian crops of this variety had been similarly kept true to type by all other growers over the last thirty years, they would unquestionably be of very much higher quality than they are at present. Fig. 4 illustrates the permitted range under certification for Late Brown Globe.

Care in Seed Production

The reasons for the present great variation from crop to crop in Victoria are not hard to find and may be briefly summarized:—

1. Every onion grower tends to be his own seed grower, and this leads quite naturally to a multiplicity of types, since no opportunity

Fig. 2. An "Australian Brown" bulb of ideal form.

occurs for growers to agree on what is a desirable standard to aim at. Furthermore, many growers do not adhere strictly to any one type over a period of years.

2. Onion flowers are readily cross-fertilized, and many crops of onion seed have been grown too close to other varieties for safety. A quarter of a mile is the very least that should be allowed between varieties, and half a mile would be preferable. In closely settled onion districts, it seems obvious that cross-fertilization must occur, and under such conditions any care given by the grower in selection of bulbs for seed purposes is largely wasted. The strain is spoilt by an admixture from a nearby crop of different strain or worse, a different variety.

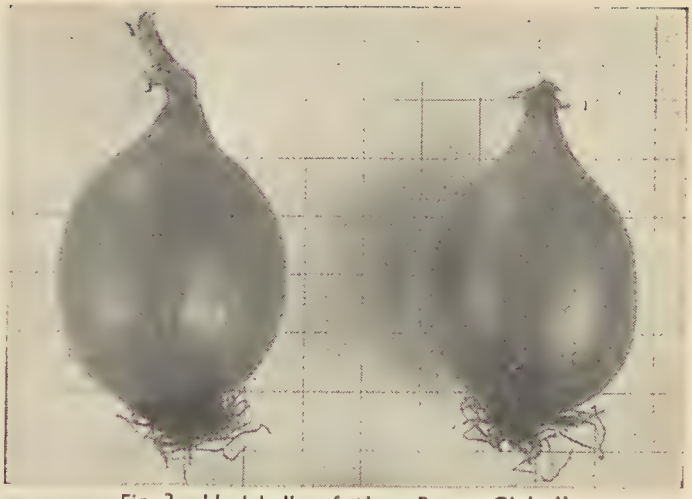

Fig. 3. Ideal bulbs of "Late Brown Globe".

3. Many growers have actually planted seed crops of Australian Brown and Late Brown Globe close together in the belief that by combining the good qualities of both varieties, they will obtain a better variety. It is true that, in the hands of a very experienced grower or plant breeder, such means might be adopted to raise new improved varieties, but the odds are that when such a practice is followed, the resulting onion is poorer than either of the parents and as anyone experienced in plant breeding could tell, it would take years of most careful selection of the resulting bulbs to ensure that a new strain which would breed true had been evolved. This practice has, undoubtedly, contributed to the confusion existing in present day onions.

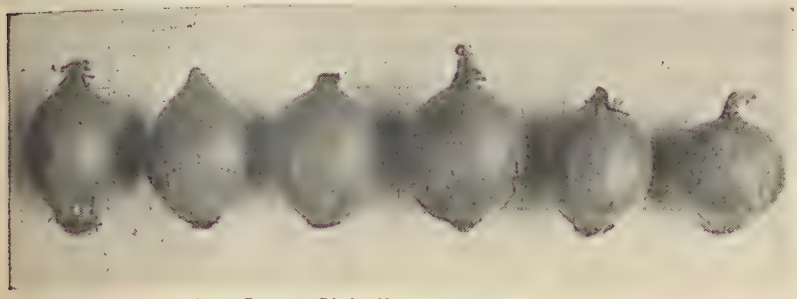

Fig. 4. Range of "Late Brown Globe" bulbs permitted in Certified "commercial strain". The centre two bulbs are the best.

Control of Seed Production

During the war it was necessary, under National Security Regulations, for all seed crops to be registered if grown for sale. While registration had undesirable features, it had the great advantage that every seed crop grown for sale had to conform to reasonable conditions designed to ensure that the resulting seed was satisfactory. It was not possible to insist under registration that the same high standard be reached as under the Certified Seed Scheme, and so the strains raised continued to vary to some extent from one farm to another, but under registration it was possible to insist that crops of different varieties should be separated by a safe distance and

Fig. 5. Range of "White Imperial" bulbs permitted in Certified "commercial strain".

that the production of seed from reject onions and picklers did not go on. Now that the National Security Regulations, with respect to registration of seed crops, have been repealed it will not be possible to check such undesirable practices. It is hoped, however, that by offering facilities for the skilled seed grower to have his crops certified, the Department will be able to assist such growers to sell their seed crops with the gradual elimination of growers whose aim is to produce seed cheaply at the expense of quality. By giving publicity to its Seed Certification Scheme, the Department hopes to be able materially to assist growers participating in it. Of course, the Department is not in a position to guarantee a market for certified seed, which must be disposed of through ordinary channels known to the seed growers, but, in general, the Department will do whatever it can be encourage the demand for certified onion seed.

Corporate Action by Onion Growers

It would be a definite forward step if onion growers throughout the State could agree on some practicable method of ensuring that our two main onion varieties were grown from seed uniform and true to type. This would greatly facilitate the satisfactory marketing of the crop, for it would make for greater uniformity not only in appearance and eating quality but also in storage life.

In order to achieve this objective it would be necessary for many growers to discontinue producing their own seed and agree to purchase high-quality and, preferably, certified seed produced by growers specializing in seed production. Organization of a workable scheme could presumably be undertaken by the Onion Marketing Board as an additional service to growers and the suggestion is submitted that the industry, in its own interests, should give earnest consideration to the whole question of seed production with a view to stabilizing the type of Victorian onion varieties. The Department of Agriculture would afford any such move every possible assistance.

GROWERS OF CERTIFIED ONION SEED CROPS FOR 1945-46 SEASON.

Grower.	Address.	Acres.
AUSTRALIAN BROWN.		
Hutchinson, W. A., and Son	Box 14, Drysdale ..	4½
Whitcombe, R. A. ..	Drysdale	4
Henderson, J. ..	Box 9, Portarlington ..	5
McLean, A. D. ..	Bellarine	2
Lindsey, P. H. ..	Woodford	11
Mills, W. E., and Son ..	Koo-wee-rup	4
Foley, Dan	Killarney	½
Kearney, J. J. ..	Killarney	½
Sheehan, W. H. ..	Killarney	2½
Brooks, R. P. ..	Weering	1
Burns, Allan	Corunnun	1
Kehoe, R.	Coragulac	½
Baxter, J. C.	Bellarine	1
Kahl, Magnus ..	Murghebolue	⅛
Lemon, J. R.	Eurack	1
BROWN GLOBE.		
Lindsey, P. H. ..	Woodford	6
Sheehan, W. H. ..	Killarney	1½
Burns, Allan	Corunnun	½
Carmody, E. P. ..	Coragulac	1
Morrissy, J. P. ..	Alvie	1
IMPERIAL WHITE SPANISH.		
Hutchinson, W. A., and Son	Box 14, Drysdale ..	1
Henderson, J. ..	Box 9, Portarlington ..	¼
Mills, W. E., and Son ..	Koo-wee-rup	5
Kahl, Magnus ..	Murghebolue	¾
Lemon, James R. ..	Eurack	1
Lowndes, James J. ..	Modewarre	¼
Speirs, F. C.	No. 1 Private Bag, Colac	1
ODOURLESS.		
Lindsey, P. H. ..	Woodford	2

NOTE.—This article summarizes the views expressed by the writer in an address to the Onion Growers' Convention at Colac on 14th March.

INSECTICIDES and FUNGICIDES

Brands Registered for 1946

By W. R. JEWELL, M.Sc., *Chemist for Agriculture*

UNDER the provisions of the *Fungicides Acts* 1928 *and* 1935, insecticides, fungicides, vermin destroyers and weed-killers must be registered with the Department of Agriculture, and it is an offence to sell any such material not so registered. Application for registration is made each year by the "wholesale dealer", who is the person primarily responsible for placing the pest destroyer on the market in Victoria; power of approval of the application rests with the Director of Agriculture.

Among other matters, the applicant must state the nature and the percentage of constituents in the pest destroyer which are claimed to be active constituents, and these must also be shown on the label affixed to the package containing the pest destroyer. The purchaser is thus informed of the nature of the material he is purchasing. He is further protected in that the Chemist for Agriculture is empowered to take a sample of any pest destroyer and, if the sample on analysis does not comply with the guaranteed active constituents on the label, to institute proceedings against the wholesale dealer or seller.

The Chemist is directed by the *Act* to prepare a complete list of all insecticides, fungicides, vermin destroyers and weed killers registered each year, and to publish this list in the *Government Gazette*. It was the usual practice before the war to publish this list also in the *Journal of Agriculture*, but shortage of paper during the war years made this impossible. However, the complete list for 1946 is again published in this issue for the information of readers. This list should be of interest to practically every farmer, as it once more reminds him that there is an *Act* for his protection in purchasing pest destroyers, and provides him with a useful list of all pest destroyers on the Victorian market, showing the various types and where they may be obtained together with the active constituents guaranteed to be present in each product.

The list covers about 375 different brands, but it will be seen that they fall into a relatively limited number of types, and the main classes in common use are few in number, for example, arsenical compounds, nicotine sulphate, lime sulphur, copper compounds and spraying oils. There are, in addition, sheep dips, dusting powders, blowfly preparations, &c., which usually contain more than one type of active constituent.

D.D.T.

To the usual list is added this year, for the first time, emulsions and dusts containing D.D.T., a material which will certainly assume a very

A general view of a lime sulphur works.

prominent position in future years. D.D.T. (dichlorodiphenyl-trichloraethane) is an organic chemical which came into prominence during the war because of its extraordinary efficiency against the body louse and the mosquito larva. Subsequent investigations indicate that it will be effective against a wide range of horticultural and agricultural pests, although it has been found ineffective against a limited number. The picture is not yet complete regarding its use in agriculture and, until further work has been carried out, registration of D.D.T. preparations is granted only for certain specific uses.

Analysing insecticides in the Departmental laboratories.

D.D.T. is not a cure-all, and it has certain toxic properties to man not yet fully understood. Horticulturists, market gardeners, &c., should therefore be guided by Departmental advice in the use of this new aid to better crop production. As definite information becomes available from investigations now in progress, the Department will issue recommendations regarding its proper use; one thing is certain, that its use will extend very considerably and rapidly as its cost is reduced, and as its effectiveness against different pests is proved.

In passing it should be explained that there is more than one form of D.D.T. These various forms, or "isomers" as chemists call them, do not differ in chemical composition, but have definitely different toxic properties. It is the para-para isomer, as it is known, which is the actively poisonous form against insects. D.D.T. as manufactured may contain widely different proportions of this particular form, so that two preparations with the same content of crude D.D.T. could behave very differently when used against the same pest, and under the same conditions. For this reason, D.D.T. preparations must show the guaranteed minimum percentage of the active para-para isomer present, irrespective of the proportion of total crude D.D.T. present.

This short article simply serves as an introduction to the list of registered insecticides, &c. Any queries regarding the list or chemical aspects of materials of the types included in the list, which appears in the back section of this Journal, should be addressed to the Chemist for Agriculture, State Laboratories, Melbourne, C.2.

TREES AROUND THE HOMESTEAD *(continued from page 198).*

8. Protect tender plants against frost by covering at night with hessian or other material.

9. Drain the site well.

Observance of the above precautions should go far towards the production of healthy, well-developed trees.

Recently the Forests Commission of Victoria issued a booklet under the title "Selection, Propagation and Planting of Trees in the Country Districts of Victoria" and copies of this publication are available from the Forests Department, Treasury Gardens, Melbourne, at a cost of 1s. 1½d., including postage. This booklet deals in greater detail with aspects of the subject discussed in this article and in particular supplies lists of species recommended for planting in the different climatic zones throughout Victoria.

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., *Horticultural Instructor*

Passion Fruit Culture

THIS delectable fruit, which is so much sought after because of the delicious flavour which it imparts to foods and drinks, has been particularly scarce of recent years, and as a result prices have been high. Although passion fruit can be grown successfully under certain conditions in Victoria, many people have wondered why it is not grown more extensively. It is a crop which appeals to many at the present time as one which should provide a reasonable chance of profitable returns and in these notes some of the pitfalls likely to face intending growers and the best conditions for its cultivation will be discussed.

The common black passion fruit (*Passiflora edulis*) is a native of South America and first came under notice when the Spanish conquered that country. The plant was given the name of passion because the flower symbolized the crucifixion, the corona representing the crown of thorns, the stamens the nails, and the pistils, the scourge.

Selection of Site.

Under the conditions of its native country, the passion fruit grows vigorously and climbs to a considerable height on jungle trees. Being a tropical plant it is not likely to flourish where frosts are severe. However, like citrus, another native of tropical zones, the quality of the fruit is improved by growing the plant in more temperate regions.

In 1937–38, there were about 150,000 passion vines growing in Victoria. The number shown in the last return from the Government Statist in 1944 was 33,000. This considerable decline is due to a number of factors, the chief being frost damage and disease. Passion vines rarely recover from a severe frost and this naturally limits the areas in which the plant may be grown in this State. The fact that there is one species of passion fruit (*Passiflora cinnabarina*) native to Victoria, suggests that there are localities which favour this type of plant. The native species is found in parts of East Gippsland, and it is known that plantations of the common black variety grow successfully in this area.

Diseases.

The reason for the decline in production in the hill country east of Melbourne was due largely to frost damage. The other factor was the susceptibility of the plant to various diseases, the chief troubles being the virus disease known as woodiness and fungous diseases causing root-rot

and brown-spot on leaves and fruit. The virus is characterized by distortion and mottling of the leaves and a thickening of the rind of the fruit, from which is derived the term "woodiness". Unfortunately, once a plant is affected with the virus there is no cure possible, so that the grower must pull out the affected plant and destroy it in order to avoid transferring the disease to other vines in the plantation. Passion fruit plants cannot withstand poorly drained soils because they are very susceptible to root and collar rots. If the soils show any tendency to become waterlogged during wet seasons, the installation of tile drains would be essential to success.

The fungous disease known as brown-spot which causes spots on leaves and fruits, does not cause the death of the vine, but renders the fruit unfit for market. Control of this disease is possible by the use of a spray of Bordeaux mixture 6 : 4 : 40, as soon as the disease is noticed.

From these few notes it is clear that the passion-fruit plant requires a frost-free location with a well-drained soil. A warm slope, preferably with an easterly aspect, is required, with adequate protection from severe northerly or north-westerly winds. The soil should be of good fertility. If the selected site is of only a moderate fertility, adequate preparation by manuring with poultry or stable manure, or growing a green manure crop would be desirable in the winter before planting.

Preparation for Planting.

The land should be thoroughly ploughed about August so that the planting may be carried out in September. It is desirable to have the trellis wires erected before planting, because erection after planting may result in damage to the young plants. The simplest method of trellising is to use posts 8 ft. long, placing these 3 ft. in the ground so that a height of 5 ft. remains above ground level. The rows should be 12 ft. apart and the plants should be set 15 ft. apart in the rows so that the posts should be placed 15 ft. apart. This permits one plant to be placed between each post. The top wire of the trellis may be secured to the top of the post and two other wires each placed at intervals of 18 inches below. Another method favoured in some localities is to form a "T" trellis by attaching pieces of wood 2 ft. wide to the top of each post and securing one wire to each end of these. The vine is lead up to the trellis by setting a stake alongside each plant long enough to reach the trellis wire.

Propagation.

Because of the saving in time beginners are advised to secure seedlings from reputable nurserymen. The raising of seedlings is a fairly simple matter, however, but good quality fruit should be selected, preferably from vines known to be healthy and free from disease. The seed should be extracted, allowed to soak in clean water for 24 hours, after which it may be washed free of pulp, dried and stored in an airtight container until required. The best time for planting is during the month of September. The plants may be raised under glass and when 2 to 3 inches high should be transferred to the open where they are planted 6 inches apart in rows 18 inches apart or preferably in 4-inch pots. The plants will be ready for planting out in the following spring.

Insufficient knowledge is yet available concerning the passion-fruit plant grafted on the banana passion-fruit rootstock, to either recommend or discourage the use of this type of plant.

Pruning.

After planting out, continual attention is required because the vines grow vigorously and must be controlled by pruning. All lateral growth should be removed to between 15 and 18 inches above ground level so that a single main stem remains. This prevents the development of damage due to collar which is likely in a much branched stem. The strongest growth should be directed along the trellis wires. The main job in the first year is to establish the framework of the vine and in succeeding years, pruning is necessary to remove any dead shoots and to shorten back any over-vigorous growths, thus encouraging the development of short fruiting laterals.

Harvesting.

The main cropping period will commence in the second year of growth. Flowering commences in November from which a crop matures in February or March. An autumn flowering produces a crop ripening in June or July.

It is not possible to forecast the life of a plantation or its yield, but some healthy plantations six years old have yielded three bushels of fruit per vine. This, of course, is an excellent result but the average yield and life would be below this, due to the retarding factors mentioned previously. It appears, however, that by choosing a suitable site and giving adequate care to the vines, passion-fruit culture offers possibilities of profit.

APPROVED SEED POTATOES

List of Growers, 1946

By

G. H. MATTINGLEY, *Potato Expert*

IN order to meet the demand for good quality seed potatoes brought about by the increasing desire on the part of many farmers to plant only the best seed obtainable, the Department of Agriculture now carries out extensive inspections of potato crops each season.

Crops of the main commercial varieties located in recognized seed-growing areas and which were planted with certified seed, are inspected in the field during the flowering period, and their value as seed is assessed according to the percentage of diseased and foreign plants present. Those crops which show no more than 7 per cent. undesirable plants including 1 per cent. "strangers" are considered suitable for seed purposes and are listed hereunder as "approved seed".

It is stressed that "approved" seed should not be confused with "certified" seed. The latter, which conforms to a much higher standard of purity and freedom from disease, is only marketed in sealed bags carrying the official certification label of the Department of Agriculture. Approved seed should be packed in bags branded "A. seed", and which carry no other distinguishing features.

Sales of approved seed potatoes may be made by direct negotiation between grower and buyer, subject to permit issued by the Deputy Potato Controller, 370 Little Collins-street, Melbourne, or any Potato Inspector.

Name and Address of Grower.	Acreage.	Tonnage Approved.
VARIETY—LATE CARMAN.		
Anderson, A. J. and D. K., East-street, Daylesford	16½	45
Andrews, H., Hesket, via Woodend	2½	22
Balharrie, A. S., Italian Hill, Daylesford	30	90
Barker, L. G., Weeaproinah	6	25
Beattie, H., Krambruk North	2	8
Beddoe, F. E., Forrest	3	11
Boustead, A. C., Dean	30	90
Bruni, W. J., Kinglake	4	16
Collery, John, Hesket, via Woodend	4	11
Crozier, G. S., Newham, via Woodend	5	15
Dans, N., Romsey	12	36
D'Arcy, F. F., Greendale	6	18
Dow, R. and W., Ferguson, via Colac	16	65
Easdown Bros., Kinglake Central	10	40
Else, J. F., Romsey	1	3
Exton, A. C., Pheasant Creek, via Whittlesea	1½	6
Exton, A. P., Pheasant Creek, via Whittlesea	1½	6
Exton, C. B. and K., Archerton, via Benalla	60	240
Exton, Chas. and Sons, Kinglake Central	95	375
Exton, J. E., Pheasant Creek, via Whittlesea	4	16
Fincher, R. L., Beech Forest	2	8
Francis, A. G., Ferguson	4	16
Gardner, R. W., Beech Forest	1	4
Glenane and Ryan, Dunnstown	3	9
Grigg, R. H., Newlyn	6	18
Gunn, N., Thorpdale	6	24
Hojrulla, K. and X., Emerald	15	60
Lawrey, L. K., Kinglake Central	16	64
Leggo, E. G. and J. R., Italian Hill, via Daylesford	20	60
Lorenz, D., Pheasant Creek, via Whittlesea	5	20
Minchinton Bros., Ferguson	6	24
Moore, R., Kinglake	26	100
Murchison, A. M. J., Ferguson	8½	33
McKay, H., Toolangi	6	22
McMahon, J. P., Kinglake	½	2
McMinn, G., Wyelangta	2	8
Nation, E. A., Weeaproinah	4	16
Nott, L. J., Kennedy's Creek, via Gellibrand	1	4
Owen, F. J. and Sons, Pheasant Creek, via Whittlesea	24½	99
Powell, D. B., Clarke's Hill	15	45
Power, E., Kinglake Central	2½	10
Pretty, A., Kinglake Central	2	8
Rolfe, W., Beech Forest	1½	6
Rosato, G., Wyelangta	3½	14
Rothe, F. M., Little Hampton, via Trentham	4	11
Russell, W. J., Porcupine Ridge, via Glenlyon	10	30
Skirving, A., "Nyora", Whitlands	2	8
Spring Bros., Romsey	4	12
Stinchcombe, B. R., Archerton, via Benalla	3½	14
Suckling, T., Clarke's Hill	5	15
Tait, E. M., Dean	17	50
Thom, J. R., Kinglake Central	15	60
Thorneycroft, W. J., Romsey	4½	14
Townsend, J. O. A., Ferguson	2	8
Trewhella, A. B., Newham, via Woodend	35	105
Trewhella, C. A., Trentham	9	27
Walsh, J. M., Warrenheip	8	24
Ware, W. E., Jumbunna	2½	10
Williamson, G. F., Tanybryn, via Colac	3	12
Williamson, T., Kinglake West	3½	14
VARIETY—EARLY CARMAN.		
Coulter, E. and W. L., McKinnon's P.O., via Leongatha	3	10
Crozier, G. S., Newham, via Woodend	2	5
Else, J. F., Romsey	7	15
Fowell, H. F. M., Narracan East	4	12
Foy Bros., Mirboo North	12	36
Higgins, O. C., Tolmie	1	3
Lester, F. and A., Pty. Ltd., Leongatha	8	25
Macrae, E. and J., Narracan	14	42
Mahar, M. F., Warrenheip	6	15
Mayo, L. C., Thorpdale	10	30
Meany Bros., Narracan	4	12
McColl Bros., Leongatha	4½	15
McKenzie, I. N., Whelan's Loose Bag, via Leongatha	1	4
Stewart, G. C., Yarragon	4	12
Stewart, T., Kernot,	3	10
Vagg, P., Fish Creek	3	10
Vance, E. S., Newham	2	7
Wight, L. R., Stony Creek	1½	6

Name and Address of Grower.	Acreage.	Tonnage Approved.
VARIETY—UP-TO-DATE.		
Beveridge, C. S., Laver's Hill	10	40
Benson, W. A., McDevitt, via Colac	2½	10
Cannon, T. W., Carlisle River, via Colac	4	16
Cartiere, G., Wyelangta	15	60
Deppeler Bros., Beech Forest	1	4
Fry, J. G., Beech Forest	2	8
Hamilton, A. B., Fish Creek	7½	30
Hamilton, E. A., Fish Creek	8½	33
Lee, J. A., Laver's Hill	3	12
McBeth, J., Neerim-road, Carnegie	6	24
McCrickard, W. J., Webster's Hill, via Beech Forest	1	4
Nott, L. J., Kennedy's Creek, via Gellibrand	1	4
O'Neill Bros., Catani	6	24
Phillips and Mazzone, Beech Forest	3	12
Rosato, G., Wyelangta	1½	6
Toomey, E., Trentham	1	4
White, R., Bair-street, Leongatha	28	110

Name and Address of Grower.	Acreage.	Tonnage Approved.
VARIETY—SEBAGO.		
Anderson, W. H., Inverloch	1	4
Berg, H. F., Trentham	1	3
Buchanan, C. J., Island-road, Koo-wee-rup	5	16
Deppeler Bros., Beech Forest	2	8
Elmar, L., "Braemar," Thorpdale	4	16
Fraser, J. A., Thorpdale	2	8
Mayo, L. C., Thorpdale	2	8
Pitman, L. H., Forrest	1	4
Taylor, T. I., Thorpdale South	8¼	33
VARIETY—KATAHDIN.		
Andrew and McIntosh, Ballan	15	50
D'Arcy, F. F., Greendale	12	40
Dempsey, F. L., Stony Creek	1	4
Frost Bros., Kerrie, via Romsey	4	16
Hamilton, E. A., Fish Creek	2½	10
Mayo, L. C., Thorpdale	8	30
Pearson, H. and J., Dumbalk	3¼	12

Certified Pullorum Tested Flocks (Poultry)

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for pullorum disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the *Journal of Agriculture*.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Owner.	Number of Birds.
Batey, L. J., Katandar North, via Yabba North	1,206
Becker, F. W., Follett-road, Cheltenham	559
Bray, J., 18 Hotham-street, Warrnambool	72
Coleman, A. J., Mountain Highway, Bayswater	141
Corbett Bros., Noel-avenue, Macleod	2,164
Christie, R. R., and Son, "St. Elmo" Poultry Farm, Tucker-road, Bentleigh, S.E.14	587
Davidson, Mrs. A. C., 22 Sherbrooke-avenue, Ringwood	142
Emmott, E. and T., Inglewood Poultry Farm, Verdon-street, Inglewood	283
Fellows, J., Yan Yean-road, Plenty	830
Gage, K. L., Clarke-road, Spring Vale	444
Gedye Bros., Railway-road, Blackburn	4,799
Giarrusso, G., Lower Dandenong-road, Braeside	770
Gibbs, Mrs. M. M., "Lomas," Yan Yean	71
Gilchrist, W. J., Rossiter-road, Koo-wee-rup	2,688
Gillespie, Mrs. L., Katamatite	128
Giovanetti, G. E., Skene-street, Kennington, Bendigo	385
Grosvenor, Messrs. E. W. and E. K., "The Haven" Poultry Farm, Springvale South	574
Hall, R. H., Wal Wal	884
Hall, W. S., Lyndhurst	955
Harrington, W. H., Harrington's Poultry Farm, 179 Woodward-road, Golden Square	1,673
Harrison, Mrs. A. M., Stenfield-street, Cobden	93
Henderson, C. W., "Clifton," Shepparton East	567
Henderson, W. R., 22 Chesterville-road, Cheltenham, S.22	110
Hewett, A. T., Central-avenue, Bayswater	1,349
Jenkins, A., "Pen-y-bryn," Ridge-road, Kallista	524
Kemp, H. L., "Glenmayon," Whitehorse-road, Ringwood East	590
Keyte, A. M., Private Bag 6, Natimuk	422
Kostos, D., cnr. Collins and Waverley-roads, Oakleigh	1,302
Lang, John, 46 Dundas-street, Thornbury	74
Latta, H. J., Langwarrin	1,557

Owner.	Number of Birds.
Major, C. D., Simpson's-road, Eaglehawk	582
McTighe, C. H., Nar Nar Goon	444
Mead, J. L., 28 Golf Links-avenue, Oakleigh, S.E.12	209
Michell, R. J., Alkooma Poultry Farm, Greensborough-road, Macleod	1,095
Molson, W. E., White Leghorn Stud, 188 Surrey-road, Blackburn	886
Moroney, J. B., Kangaroo Flat, via Bendigo	1,673
Muir, J., Quabba Poultry Farm, Wantirna-road, Ringwood	1,239
Nemet, P., Spring Vale-road, Spring Vale South	2,622
Nichols, Mrs. Ella M., "All Red Poultry Farm," Yan Yean	543
Poulton, A. W., Vickers-street, Sebastopol	1,687
Power, M. J., 8 Danin-street, Pascoe Vale, W.8	858
Reher, F., Burwood	2,125
Salmond, J. B., "Peerless" Black Leghorn Yards, Deer Park	245
Sanders, A., Stud-road, Wantirna	428
Smith, H. A., Marong-road, Maiden Gully	1,391
Swift, D. A., Kangaroo Flat, via Bendigo	2,226
Voigt, A. H., Noble Park	1,395
Waldman, F., "Karale" Poultry Farm, Greythorn-road, North Balwyn	584
Watters, N. J., 6 Alpine-grove, Pascoe Vale, W.8	139
Welch, T. A., cnr. Bayswater-road and Central-avenue, Bayswater	1,944
Wernli, J. H., Alpine Poultry Farm, cnr. Wilson and Jellicoe streets, Cheltenham	649
Whitham, R. S., 28 Neville-street, Glenhuntly	132
Williams, V., 91 Tone-road, Wangaratta	726
Winter, G. S., "Denehurst," Murgheboluc	714
Wohlers, S., Box 17, Jung	261
Wooster, G., "Viola," Clarke-road, Spring Vale	657
Yates, W., 64 Bank-street East, Ascot Vale	35

Our picture, taken just prior to the war, shows portion of the Grand Parade, a feature of the Royal Agricultural Show, Melbourne.

Live Stock Notes

Compiled by A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

THE first Royal Agricultural Show to be held in Melbourne since 1939 will take place in the coming spring, and record entries of cattle and other live stock are anticipated. A considerable amount of labour and expense are involved in preparing stock for the Show, and it is essential that the right animals for exhibition purposes should be selected. Breeders should exhibit only those animals which will advertise their studs. They should be worthy of a prize or at least capable of bringing a good price in the sales.

Cattle for the Show should be selected early so that they can be trained and brought into good condition. The training takes up a good deal of time, and, therefore, should be commenced before it is necessary to house the cattle in June. When housed, the animals should be tied in stalls where they can be well fed, groomed, washed, and exercised. Dairy cattle should be rugged.

Good feeding should commence now, but the animals should be given no more feed than they can consume before the next feed, for no animal will thrive with stale feed before it. Four feeds a day are desirable and these should be given at regular intervals. Ground oats, bran, a little linseed meal and good oaten chaff provide a good basic ration for feeding at 6 a.m., 11 a.m., and 4 p.m., with greenstuff or exercise on green pasture at 1 p.m. and lucerne hay at 7 p.m. Some salt and ground limestone should also be given in the feed.

Regular grooming is necessary to develop a smooth, glossy coat and soft supple skin. The white hair of certain breeds of cattle needs regular washing to remove stains. Some breeders wash cattle all over regularly, but such washings should only be necessary just prior to judging.

Exercise is necessary and the animals should be taught to walk briskly while being led, to hold their heads up and their backs straight and

to place their feet down deliberately. The beast should also be taught to stand squarely on its four legs with head up and alert. Too many cattle are brought into the show ring too fat and too sore-footed to walk. They have to be pulled round with their backs roached. Show stock should be paraded before visitors who should be encouraged to handle them in the same way as a judge, so that they will not be timid at judging time. Animals cannot be trained at the showgrounds.

The beast that looks best in the paddock, the proven sire or the cow with the best butterfat production does not necessarily win at the show, where good looks on the day and good training are the main considerations. The judge is able to place the animals on their appearance only and has to consider his own fancies, the breeders' fancies and onlookers who pay to see a show of sleek, fat, attractive animals, irrespective of their worth as breeders or producers.

There are many minor matters that need attention, such as the trimming off of shaggy hair, clipping the head and udder, training and polishing the horns, although dehorning will eventually eliminate this, massaging lumps so that fat is distributed evenly, &c. All of these things are carried out with the object of accentuating the good points of the beast and hiding its weak points. Clipping and horn training need attention early. Polishing of the horns is a last minute job. The feet need to be kept neatly trimmed, but this is an essential job whether cattle are to be exhibited or not.

Today there is little point in exhibiting stock which are not known to be good producers, as farmers purchasing sires are demanding information as to their breeding potential.

Bull Calf Purchase Scheme

In 1927, the Government introduced the Bull Calf Purchase Scheme to assist bona fide dairy farmers to purchase pure-bred bull calves from dams which had produced good yields of butterfat in the Standard Herd Test.

This assistance, which amounts to half the purchase price of the calf, is given only where the dairy farmer is unable to purchase the calf himself direct. It is not customary to supply a second bull calf through this Scheme, but where a dairy farmer has suffered severely as the result of drought, bush fires, floods, absence on active service or other similar cause, a second application may be considered. Dairy farmers desiring assistance in the purchase of a calf must make application on the form provided. The conditions of sale to the dairy farmer are set out on these forms. In addition to paying half the purchase price of the bull, approved applicants must pay all transport and other charges incidental to delivery.

Bull calves of all dairy breeds are distributed through the Scheme although at the present time breeders have no Guernsey bulls to offer.

Payment for a bull allotted under this Plan is computed at the rate of 1s. per lb. on the highest butterfat record of the dam under the Government Standard Herd Test—without allowances. In addition, in respect of bulls over the age of three months, a sustenance allowance of £2 is paid for each period of three months or portion thereof that the bull is retained by the owner prior to allotment, provided that the maximum payment for sustenance does not exceed £6.

Since its inception, over 2,500 bulls and bull calves have been distributed through this Scheme.

Before any bull which is offered for sale through this Scheme is allocated, it is inspected by an officer of the Department of Agriculture, to ensure that it is thrifty, well-developed, properly tattooed and of good type.

Dairy Cattle Wanted

Many farms, including those used for dairying, are understocked today. This is due to a number of causes, chief of which are the prolonged drought of 1944–45, and the attractive meat prices prevailing for dairy cattle and other stock. Simply stated, stock for restocking are not here to be bought, and the only way to build up the herds again is to rear every calf. In addition to heifer calves which are so necessary to bring dairy cattle numbers up to pre-war figures, the early dairy-bred bull calves should be reared to increase beef production.

Feed supplies are now assured for the next eighteen months and, with cattle numbers so low, the rearing of every calf appears to be the soundest of business propositions.

Record autumn and winter milk yields are possible and with the abundance of pasturage and more readily available supplementary feeds, the usual feeding problems should not recur this year.

Calves born between now and October do best. The early calves may be weaned on to good pasture in October and the heifers can be calved down as well-grown two-year-olds early in 1948. Early calves and early calvings are always desirable.

Calves do best on new milk for a few weeks, and then skim milk supplemented with linseed meal and pollard. Such rations are economical. Where no skim milk is available, calves can be reared on as little as 25 gallons of new milk fed during the first few weeks and then on substitute gruels. Many good gruels are used by mixing pollard, linseed meal, ground wheat, dried skim milk, dried whey, &c., in various proportions. There is no standard gruel, but if only one cupful of milk can be added to a gruel, the calf will thrive so much better.

Half a pound of pollard, half a pound of linseed meal, one teaspoonful of salt and one teaspoonful of lime mixed with one gallon of boiling water, cooled to 95° F., makes an excellent meal for a six-weeks-old calf. If a cupful of milk can be added so much the better.

Cheese whey can be used instead of the boiling water and in that case only half the quantities of pollard and linseed meal would be necessary. Use boiling whey or boil the gruel to neutralize any toxic effects in the linseed meal.

A pamphlet, "Dairy Calves," providing further information on the subject of calf-rearing is available free, on application to the Director, Department of Agriculture, Melbourne, C.2.

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It Pays to House Pigs Well

It is more difficult to produce good pigs profitably in winter than in summer, because in winter the pigs grow more slowly, they require more food for each pound of growth, there are more deaths of young pigs and the quality of bacon fat is not so good as that produced in warm weather.

When the causes of these winter disabilities are understood some action can be taken to alleviate them.

The cost of food is easily the biggest item in the cost of producing a baconer and whether purchased or home grown, the foods used to breed, rear and fatten a baconer of 140 lb. carcass weight are worth about £4 at present.

In the initial capital outlay for pig farming the largest item of expenditure is housing, but as housing is used for many years, its charge on each baconer produced is in the form of interest and depreciation, which for really first class accommodation is something less than 4s. on each baconer bred, reared and fattened therein.

It has been demonstrated in England that when pigs are housed under conditions which do not provide them with reasonable comfort and protection from extremes of climate, there is a substantial increase in the quantity of food required to produce a baconer. Increases of up to 15 per cent. in food requirements are quoted, which on current Australian values is equivalent to a loss of 12s. on a baconer, so good housing should soon pay for itself by saving food.

It is conceivable that a similar saving could be effected in Australia by providing good housing for pigs.

Just what constitutes good housing varies from one region to another and from farm to farm. Substantial protection is more necessary in the wetter and colder districts than in districts with a mild climate.

Whether pigs should be kept in well-constructed intensive pens, which are mostly enclosed with walls and roof or in extensive grazing paddocks with less substantial shelter sheds is a matter for each farmer to decide for himself. Each system gives satisfaction when properly managed, and the results are affected more by the man who attends to the pigs than by the system of housing.

Because large numbers of pigs are kept in small areas under artificial conditions in intensive pens the design, construction and management must be of a high order if good results are to be obtained. The floors should be hard and well-drained, there should be at least 8 square feet of floor space in the sleeping section for each baconer, the drainage should be away from the sleeping place so that it may be kept dry. The walls should be solid to avoid draughts. Draughty houses are probably worse than no houses.

The number of pigs kept in each pen should be regulated to avoid over-crowding which is detrimental to the pigs' health.

The liberal use of straw bedding in winter gives the pigs extra comfort and helps to retain their body heat, the loss of which must be

compensated by the consumption of extra food, thus, straw outside the pigs saves food inside them.

Intensive pens should be constructed so that their open side is on the north to north-east to permit early morning sun rays access to the pigs and the floor of the pen in the winter, when the sun is to the north. The other three sides should be enclosed to protect pigs from rain and from excessive summer sun.

Pigs which are run in extensive grazing paddocks are disinclined to use shelter-sheds excepting in wet or very windy weather. They are frequently seen sleeping in the open on frosty nights apparently by choice. Shelter-sheds provided for paddocked pigs should be so constructed as to give good protection from bad weather when the pigs really do need it.

Occasionally one sees pig paddocks with thick scrub or trees which pigs apparently prefer to camp in, even when good sheds are provided for them.

Special care should be taken during winter to keep newly-born pigs warm. About 25 per cent. of the pigs born do not survive for even one month. Probably the greatest predisposing cause of this loss is exposure of newly-born pigs to cold. Although most of the deaths of pigs soon after birth are usually attributed to the sow lying on them, it is probable that over-lying would not occur so frequently if the young pigs were stronger and more able to escape the clumsy sow.

It is a good plan to fix boards about 1 foot above the floor across the two back corners of the pen from 3 ft. along each wall, thus providing a safety zone for the young pigs. If plenty of straw is provided under these corner boards, the pigs can keep warm and safe when they are not out seeking refreshment from their mothers. A part of the corner boards should be hinged to form a lid for inspection and cleaning.

The bad effect of winter on the quality of bacon is due to the formation of soft fat.

Bacon-curers, storekeepers and housewives all like bacon fat to be firm, because firm fat has a better appearance and does not waste so much in cooking as soft fat does.

Among the causes of soft fat in bacon pigs are a slow rate of fattening, and cold weather conditions. Therefore, by providing warm housing and keeping pigs growing and fattening at a fast rate depreciation in the fat quality of the resulting bacon can be avoided.

[L. A. Downey, H.D.A., Pig Expert.]

Poultry Notes

Mortality rates on some farms are such that poultry raising has become a somewhat risky business.

Poultry diseases cannot be cured by nostrums. No magicians exist amongst poultry experts, veterinarians, or poultry farmers of long experience, who can wave a wand over a flock of unhealthy poultry and restore them quickly to good health, or even prevent the occurrence of disease if haphazard methods are adopted. The industry can be maintained at a high level of efficiency only by the practice of sound poultry husbandry.

Poultry farmers are advised to purchase stock from farms on which disease is absent. However, such stocks are just as susceptible to diseases as other birds, if they are not properly cared for in their new surroundings.

Recent experiments have indicated that birds specially selected for establishing strains with greater resistance to certain diseases, were effective in reducing mortality.

The normal poultry breeding season will commence in June, and only the best birds should be selected for this purpose. The selection of breeders is one of the most important undertakings for the year, as success will depend upon the judgment displayed in mating the right birds.

Few poultry farmers single-test or trap-nest their hens and, therefore, must rely on appearance and handling alone in their selection of breeding stock. It is an advantage to introduce into the flock at regular intervals some specially good stock, bred by those who specialize in pedigree breeding and single testing.

Poultry farmers should make a study of the principles of correct breeding. Good size, for instance, is an indication of good growth and development, while a bird that has not suffered any illness during the first two or three years of its life would appear to have developed some resistance to disease, especially if other birds in the same pen had developed ailments. Resistance to disease, good growth, and development, as

well as a good egg-yield, are the main considerations when selecting breeding stock. But it should also be realized that all the care taken in the selection of the breeding stock will be of little avail in establishing a successful poultry farm if the birds are not kept under comfortable and sanitary conditions and well fed.

[H. F. Clinton, Poultry Expert.]

Bee-keeping Notes

Wet weather conditions are causing many apiarists concern in the Red Ironbark and Grey Box areas. Bees in some sections are reluctant to work the bloom of the Ironbark, as the nectar is too thin. These honeys when gathered under such moist conditions, generally prove to be poor wintering stores as they may ferment and cause heavy mortality to the colonies. To overcome and minimise losses from these conditions, replacement of stores, and a movement away from these areas are necessary.

Many apiarists move on to the desert banksia, a first-class wintering honey, and remove the poor stores for extraction purposes, before the winter sets in. If sufficient nectar is not available for wintering, a supply of good wintering honey or sugar syrup should be given to the colony.

It is time now to check over all colonies to see that they have laying queens.

Queenless colonies should be united with those of about equal strength containing a laying queen. If the queenless colony is placed over the colony containing the queen, with a sheet of newspaper between the two hive bodies, the bees will gradually gnaw away the paper and unite peaceably. The operation can best be carried out at dusk when bees have finished flying.

Each colony should have ample stores to carry it over winter until the spring bloom. It takes about 60 lb. of stores to winter a large two-storey colony, and a lesser amount, according to the quantity of bees, and brood present in the late autumn, in a smaller colony.

[W. A. Collins—Apiary Inspector.]

VETERINARY NOTES

Blood Samples

The forwarding of blood samples to a laboratory is necessary for the accurate diagnosis of a number of diseases in live stock, such as—contagious pleuro-pneumonia and contagious abortion in cattle, brucellosis in pigs, and pullorum disease in poultry.

It is essential that the blood sample should be collected in an aseptic manner, and that the bottle and cork used should both have been sterilized by boiling and dried in an oven.

Quite often, through lack of care, blood samples are received at the laboratory in a condition unsuitable for testing owing to the development of haemolysis in the blood. Haemolysis occurs when the red corpuscles of the blood become disintegrated, and two common causes of this are :—1. Allowing methylated spirits, antiseptic solution, or water to enter the bottle or tube with the blood. 2. The action of bacteria. Bacterial decomposition of blood is more likely to occur during warm or hot weather. The development of haemolysis may be retarded by keeping the blood samples as cool as possible, and by avoiding delay in despatching them to the laboratory.

Blood samples should be forwarded to the Veterinary Research Institute, Parkville, N.2. They should preferably be forwarded by rail and the package addressed as follows :—

The Veterinary Research Institute,
c/o Spencer (or Flinders) Street, Station,
Melbourne.

Packages are collected twice daily, but it is advisable to notify the Director of the Institute of the despatch of the samples.

[A. R. Grayson, B.V.Sc., Senior Veterinary Officer.]

Registration of Stallions

Twenty-Sixth Annual Report

By R. J. deC. TALBOT, B.V.Sc.,
Chief Veterinary Inspector

AS was to be anticipated following the most disastrous drought ever experienced in Victoria, the number of draught stallions registered under the *Horse Breeding Act* for the year 1945–46 was lower than that for the previous year, being 295 compared with 367. The number of three-, four-, and five-year-old stallions examined was 52, of which 39 were certificated.

The number of all classes of stallions registered was 295 draught, 222 light, and 197 pony stallions—a total of 714, which was 96 less than the number registered for the previous year.

As was stated in last year's report, there has been a steady decline in the number of stallions registered under the *Horse Breeding Act* since 1936, and with an increase in power farming it may be anticipated that a further reduction in the number will take place.

In view of the excellent seasonal conditions now prevailing in Victoria, and as a result of the serious drop in the horse population due to the drought, an increased number of horses will, undoubtedly, be mated this year.

During the year under review the number of stallions examined by the veterinary staff with a view to registration was 52 draught, 63 light, and 67 pony stallions, a total of 182. Of these 12 (6·59 per cent.) were refused registration because of unsoundness, and 18 (9·89 per cent.) because they were considered to be below a reasonable standard of type and conformation. 152 stallions were passed for registration.

The total percentage of rejections (16·48) is higher than last year but, in view of the comparatively small number of stallions examined, may not be significant, and is lower than the average since the inception of the Act.

Reduction in Fees

Owing to the falling off in horse breeding, the Government decided to amend the regulations of the *Act* to provide that the total annual fees payable in respect of a stallion from 3 years to 15 years, inclusive, should be £1 10s. instead of £3 as formerly. The fee payable in respect of a stallion 16 years and over remains at £1 1s.

Two-Year-Old Colts

In 1939 *The Horsebreeding Act* was amended to provide for the registration of two-year-old colts whose owners desired to use them for stud service.

Owners must make application for registration on the prescribed form, and such application must be accompanied by a fee of £1.

The colts must be submitted for examination by a Veterinary Officer, and, if passed, will be registered as a colt for one year.

During the season 1945–46, 10 colts were examined and 9 were registered.

Bonus for Foals Increased to £4

In 1941, with a view to encouraging the breeding of the best type of draught stock, the Government decided that a bonus of £2 would be paid to the owner of every foal, the progeny of a registered draught stallion and a mare approved by the Chief Veterinary Inspector.

For the season 1946–47 it has been decided to increase the bonus to £4.

Application for the foal bonus should be made to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Parades for Coming Season

A schedule of parades is not being arranged for this season. Where possible, arrangements will be made to examine stallions at centres most convenient to those owners from whom applications have been received. Applicants should state which main town would be suitable for them to present their stallions for examination, and they will, in due course, be advised of the date, time, and place arranged for the examination.

Provided owners forward their applications by the 1st July as required, it is felt that, by such an arrangement, every stallion will be examined before the commencement of the breeding season.

Applications for registration must be made on the prescribed forms before the 1st July, and must be accompanied by a fee of £1 10s. (£1 for registration and 10s. for compensation fee) in respect of stallions 15 years of age and under, and a fee of £1 1s. in respect of stallions 16 years or over 16 years. The necessary forms may be obtained from the Chief Veterinary Inspector, Live Stock Division, Department of Agriculture, Melbourne, C.2.

Changes of ownership must be notified without delay, so that certificates of registration can be endorsed accordingly. Registration expires within 30 days of change of ownership unless the required notice is given.

LIST OF UNREGISTERED STALLIONS RETAINED BY OWNERS FOR USE WITH THEIR OWN MARES

Under the provisions of the Horse Breeding Act, the owner of any stallion, the registration of which has been refused, may, on payment of a fee of £1 per annum, and notification to the Chief Veterinary Inspector, retain such stallion for breeding purposes with his own mares only.

Name.	* Age and Class.	Owner and Address.
Baron Bold	A. D.	Mrs. D. A. Daly, P.B., Detpa
Benambra	A. D.	Nankervis Bros., Corryong
Ben Bowyang	A. D.	S. J. Wilson, Nar Nar Goon
Black Prince	A. P.	W. K. Thomas, Mt. Cole Creek
Black Star	A. L.	D. Madill, Koyuga South
Bonnie Prince	A. D.	J. Moore, Woori Yallock
Boy Caledon	A. T.	Naughton Bros., Omeo
Bravia	A. T.	E. J. Wright, Flynn
Danny Boy	A. L.	W. Meagher, Danyo
Devon Point	A. L.	J. Manifold, Weerite
Ethalidale Scotson	A. L.	H. H. T. Kramer, Lawloit
Fifeness Flash Baron	A. D.	H. L. Treasure, Stratford
Flash	A. P.	A. F. Sanders, Sale
John McElwyn	A. P.	D. Bamford, Beeac
Keayang	A. D.	Jas. Blain, Dixie
Lee Wah	A. L.	Mrs. M. J. Forster, Pyramid
Like Vin	A. L.	A. Schier, Charlton
Lord Victor	A. D.	J. Montgomery, Milawa
Majestic Knight	A. P.	Miss G. Small, Ferntree Gully
Marcovitch	6 P.	T. Spong, Ascot Vale
Merry Prince	A. D.	W. A. J. Pearse, Nyah West
Model	A. D.	G. B. Wilson, Timboon
Pinto Pete	5 L.	V. A. Hicks, Melbourne
Prince	A. D.	A. H. Fawson, Bairnsdale
Prince	A. D.	F. Justin, Camperdown
Punch	A. D.	W. Earl, Woodside
Punch	3 P.	P. S. Row, Colac
Pyjamas	A. P.	Boyd Bros., Koroit
Rhys Owen	A. L.	Mrs. N. M. Hossack, Watsonia
Rob Roy	A. P.	Miss E. A. Small, Hawthorn
Sand Storm	5 L.	W. R. Coto, Sale
Skylark	5 P.	J. Skehan, Sale
Smart Lad	3 T.	H. Dunbar, Traralgon
Sunset Trail	A. T.	Estate of R. H. Wilson, Raywood
Sylvester Ronald	5 D.	T. G. Parker, Boort
Talisker Prince	A. D.	W. Stone and Son, Kialla
The Vanquisher	5 T.	Estate of E. J. Gleeson, Macarthur
Waldairas King Knight	A. D.	Boyd Bros., Koroit
Warrangee Oswald	A. D.	G. Lord, Eskdale
Worawingeth Allenby	A. D.	W. T. Rowe, Wallinduc

* NOTE.—Age in years. A., aged; D., draught; L., light; P., pony; T., thoroughbred.

SUMMARY OF STALLION EXAMINATIONS, 1945-46.

—	Draught.		Light.		Pony.		Total.	
	Examined. 52.	Certificated. 39.	Examined. 63.	Certificated. 55.	Examined. 67.	Certificated. 58.	Examined. 182.	Certificated. 152.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bone Spavin	..	..	1	1·59	1	1·49	2	1·1
Nasal Disease	..	..	1	1·59	..	..	1	·55
Ringbone	1	1·92	..	..	1	1·49	2	1·1
Sidebone	6	11·54	..	..	1	1·49	7	3·84
Through unsoundness ..	7	13·46	2	3·18	3	4·47	12	6·59
Through disapproval ..	6	11·54	6	9·54	6	8·94	18	9·89
Total	13	25·00	8	12·72	9	13·41	30	16·48

SUMMARY OF STALLION EXAMINATIONS, 1944-45.

—	Draught.		Light.		Pony.		Total.	
	Examined. 70.	Certificated. 61.	Examined. 66.	Certificated. 55.	Examined. 52.	Certificated. 49.	Examined. 188.	Certificated. 165.
	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.	Rejected.	Percentage Rejected.
Bone Spavin	..	..	1	1·51	..	..	1	·53
Bog Spavin	..	..	..	..	..	..	..	..
Chorea (Nervy)	..	..	..	..	..	..	..	..
Curb	..	..	1	1·51	..	..	1	·53
Ringbone	1	1·42	..	..	..	..	1	·53
Roaring..	..	..	1	1·51	..	..	1	·53
Sidebone	5	7·14	..	..	1	1·92	6	3·19
Stringhalt	..	..	..	..	..	..	..	..
Thoroughpin	..	..	..	..	..	..	..	..
Through unsoundness ..	6	8·56	3	4·53	1	1·92	10	5·31
Through disapproval ..	3	4·28	8	12·12	2	3·84	13	6·91
Total	9	12·84	11	16·65	3	5·76	23	12·22

THE FLOWER GARDEN

By

T. H. KNEEN, B.Agr.Sc.,
Acting Principal, School
of Horticulture, Burnley.

Garden Hedges

IT is unusual these days for the new home builder to erect more than a low fence on the street frontage, and he will usually share with his neighbour a low sub-divisional fence running from the street to a point level with the front face of the dwelling. Thereafter, the fencing arrangement merges into the conventional paling fence to preserve a necessary degree of privacy.

The formal hedge on the street frontage has also disappeared, frequently to be replaced by an informal shrubbery, which can be made to secure any degree of privacy or shelter required, besides being a much more interesting feature.

Nevertheless, a hedge is sometimes favoured, and, when neatly trimmed, can be a very satisfying feature. Sometimes it is a most desirable asset where protection for the garden is necessary, as for example, in exposed coastal locations. One need only instance the good use made of such hedge subjects as the Mirror Plant (*Coprosma Baueri*), Coast Titree (*Leptospermum laevigatum*) and Boobialla (*Myoporum insulare*). The Mirror Plant is a hardy evergreen, native to New Zealand, and is propagated readily from seed. It is often used to fill in gaps in old hedges when other plants, because of the exposed position, would be difficult to establish. While held in poor esteem by those whose conditions favour more interesting subjects, it is a boon to gardeners near the sea.

The coastal ti-tree is a well-tried hedge for sandy coastal areas. It is a vigorous grower and should be cut at least twice a year to keep it small enough to trim without the aid of the step-ladder. It is easily raised from seed, which in any case germinate in large numbers following scrub fires or burning off operations, wherever this species is to be found. These seedlings are easily moved when only a few inches high, with a generous ball of earth taken out with the spade.

The Boobialla is another useful native evergreen, and its use can be extended to districts subject to drought, as well as exposed coastal regions. It is certainly a useful plant for farm planting. Those who are interested in hedge plants for farm use are advised to communicate with the Forests Commission of Victoria for further information on this subject.

Perhaps the most common hedge plants in use at the present time are *Lonicera nitida, Berberis Thunbergii atropurpurea* and *Pyracantha crenulata.*

Lonicera nitida makes a good small hedge up to 3 or 4 ft. in height. This plant is a variety of honeysuckle, dwarf and bushy in habit, and bearing small creamy-white flowers in summer.

Pyracantha crenulata makes a hedge up to 8 ft. in height. This is an evergreen with white flowers and a dense covering of red berries in the autumn.

Berberis Thunbergia atropurpurea is useful for a small hedge up to 4 ft., and is of special value for the bronze-red foliage lasting from spring until autumn.

The species mentioned above can be planted 3 ft. apart with the exception of Berberis, which should be planted 2 ft. apart. This is a suitable month to plant out hedges, while the

soil is yet warm enough to enable the plants to become established before the cold winter months.

The effectiveness of a formal hedge does not necessarily lie in close and frequent trimming, however neat the work may be. In a simple hedge, the top lines should flow freely from beginning to end, following naturally the contours of the ground, or other features such as fences. The eye is very quick to register any marked divergence of the lines of a hedge from these features. The sides of the hedge need attention, as any "waviness" in the sides affects the appearance of the top lines, especially in high hedges.

Some gardeners like to introduce various geometrical patterns into their hedges, but such features take extra care and time to maintain, attention which might be better given to more interesting parts of the garden.

THE VEGETABLE GARDEN

Prepare for Spring Planting

May is a disappointing month for the enthusiastic novice, especially if he chooses that month to start his gardening operations. A quick examination of a reliable planting guide will show that his efforts must be confined to a mere handful of crops, the most important of which are cabbages, onions, broad beans and lettuce. Nevertheless, May is an important month in which o lay the foundations of next season's gardening, and to prepare new ground for use in the spring.

If vacant plots are available it should be decided now which of these crops will be grown, and preparations made accordingly. Broad beans should be established without delay, followed by lettuce, cabbages and onions, choosing for each of these last three, varieties suitable for sowing or planting this month. A list of suitable varieties is given below.

For broad beans the choice is a simple one between the tall growing *Leviathan Long Pod* or *Cole's Dwarf Prolific.* The approximate time for which these crops will occupy the ground is also indicated in the table, which should be read with an eye to future planning.

Crop Rotation

The subdivision of the plot for these crops offers an opportunity to apply sound rotation methods. The broad bean plot can be used with advantage for leaf crops or tomatoes in the spring. The onion plot can be used for late summer crops of French beans, and the cabbage plot for carrots. In other words, each plot can be designed so that it will be occupied by legumes, leaf crops and root crops in succession. Rotation of crops is desirable for several reasons, not the least important of which is control of diseases which are carried over in the soil and on crop remains.

Rhubarb and Asparagus

The time is opportune to make preparations for the planting of asparagus and rhubarb crowns in June-July.

Rhubarb should be the first choice as only a few plants are needed—say one or two for each member of the family. Consideration should be given to the choice of a winter-growing variety, as well as the normal summer-growing types.

The objection to asparagus is the large space required if a reasonable family supply is to be maintained. It is hardly worthwhile having less than 40 plants for a family of five, and these would occupy a bed measuring 15 ft. by 15 ft. Such a bed is virtually unproductive for 8 or 9 months of the year.

The ground for these crops could be prepared now by trenching and incorporating in the lower layer a liberal layer of well-rotted cow or stable manure, or compost. In the case of asparagus, it is well to remember that the crowns will be planted as deep as 6 inches so that the manure should be placed below this level. Rhubarb crowns are planted close to the surface.

SOME VEGETABLE VARIETIES FOR MAY PLANTING.

Vegetable.	Variety.	Occupy Ground for—
Broad Beans ..	Leviathan Long Pod .. Cole's Dwarf Prolific	6 months
Lettuce ..	New York (plants) .. Webb's Wonderful (plants)	3 months
Cabbage ..	Parisian (seed)	4 to 5 months
Onions ..	Silverskin (plants) .. Odourless (plants) Victorian Brown (seed)	8 months

Fig. 10.—Spear Thistle.

Leaves with large teeth, ending in spines, the margins spiny, usually white and woolly below.

Stems winged and spiny, furrowed and hairy.

This thistle is probably so well-known that except for purposes of comparison with other species, any description is superfluous. It is a biennial, reaching a height of 2 to 4 feet. Proclaimed for Colac (Shire and Borough) and Koroit (Borough).

HARD-HEADS (Turkestan Thistle, Russian Knapweed, Creeping Knapweed).

Botanical Name.—Centaurea repens. L. (given as *Centaurea picris.* Pall. in *Flora of Victoria,* 1930 edition).

Heads small.

Flowers purple to white.

Bracts not spiny, bearing a small membranous flap at the tip.

Leaves narrow, stalkless, mostly under 1 inch long, with no spines; coarsely toothed bottom leaves and a few small teeth on upper leaves.

A slender, branched, slightly woolly perennial, with black creeping roots, reaching a height of 1 to 2 feet. A proclaimed weed for Kerang, Swan Hill, Karkarooc, and Cohuna.

GLAUCOUS STAR THISTLE.

Botanical Name.—Carthamus glaucus Bieb. [*Kentrophyllum glaucum* (Bieb.) Fischer et Mey.].

Heads small, surrounded by a few small spiny leaves.

Flowers purple.

Bracts narrow and spiny.

Leaves narrow, 1 to 2 inches long, with a spiny tip and 2 to 4 pairs of marginal spines.

Stems white, irregularly branched.

Fig. 11.—Hard-heads.

Fig. 12.—Stemless Thistle.
[Flora of Sth. Aust.

This very prickly annual thistle resembles Saffron Thistle except for its purple flowers (instead of yellow) and its usual absence of woolliness. It is proclaimed for Kowree and Glenelg.

STEMLESS THISTLE (Stemless Onopordon).

Botanical Name.—Onopordon Acaulon L.

Heads large, globular, spiny, occurring several together in rosette of leaves on ground surface.
Flowers white.
Bracts rather narrow, ending in a single unbranched long spine.
Leaves large, white-woolly on both sides, with spiny wavy lobes.
Stem.—None.

A biennial which is easily recognized, as it is the only thistle recorded to date in Victoria which does not send up a stem. At present it is most common in the north-west of this State. Proclaimed for Karkarooc, Borung, Birchip, Wycheproof, Swan Hill, Donald, Kara Kara, Kerang, Lowan, Walpeup, and Wimmera.

GOLDEN THISTLE (Spanish Salsify).

Botanical Name.—Scolymus hispanicus L.

Heads stalkless, set between the stem and the upper leaves, and containing only a very few flowers (usually two or three), prickly.
Bracts pointed and prickly.
Flowers yellow.
Leaves.—At base, 6 to 10 inches long, stalked, and variegated with light spots. Margins irregular, prickly.
Stem winged and prickly.

The Golden Thistle is a garden escape, widely spread but not common in this State. It is a biennial, growing 2 to 3 feet high, with an edible root (when cultivated).

Proclaimed for Shires of Avoca, Bet Bet, Creswick, East Loddon, Gordon, Glenlyon, Huntly, Korong, Maldon, Marong, Newstead-Mt. Alexander, and Tullaroop.

SCOTCH OR HERALDIC THISTLE (Cotton Thistle).

Botanical Name.—Onopordon Acanthium L.

Heads large, arranged in a group topping the stems, or along the stem near the top, spiny.
Flowers purplish.
Bracts woolly at the bottom, ending in a long unbranched orange-coloured spine.
Leaves very spiny along the margins, which are toothed or cut, and wavy. Leaves white-woolly. (Var. *viride* Michet—leaves green above.)
Stems white-woolly, with broad spiny wings.

The plant is a biennial, 2 to 6 feet high, and is reputed to be poisonous. Although the supposed heraldic thistle of Scotland, it is not native to that country, and is rare there.

Proclaimed for Maffra Shire.

Thistles which are Not Proclaimed Weeds

CRISPED THISTLE (Welted Thistle).

Botanical Name.—Carduus crispus L.

Heads medium-sized (see Fig. 3), globular, spiny, clustered.
Flowers purple.
Bracts narrow, with a spreading or curved terminal spine.
Leaves rather narrow, prickly, and with irregular margins.
Stem winged and prickly, more slender than Spear Thistle.

This annual or biennial species is widely spread in Victoria. As in the case with Spear Thistle, it often has more than one strong root (see Control Measures).

KNAPWEED (Hard-heads Knapweed).

Botanical Name.—Centaurea nigra L.

Heads globular, terminating branches, non-prickly.
Flowers purple.
Bracts end in a brown or black flap of fringed tissue instead of a spine.
Leaves.—Lower leaves coarsely toothed or lobed, rather narrow; upper leaves with very few teeth, if any, and with the base clasping the stem. None of the leaves are prickly.
Stem not winged, but lined, and somewhat hairy.

The heads are of the characteristic thistle shape, though neither they nor the leaves and stems are spiny. The fringes of the bracts are very conspicuous and should serve to identify the plant (see Fig. 2, No. 11). It is a perennial growing to 1 to 2 feet high, and is widely spread in Victoria.

SAFFLOWER.

Botanical Name.—Carthamus tinctorius L.

Heads not spiny, tapering upwards, surrounded at base by a few small leaves.
Flowers orange-coloured, forming a conspicuous crown over the head.
Bracts prominently ribbed, pointed, but not spiny.
Leaves broad, with or without toothed margins, non-prickly.
Stem pale, not winged.

Safflower has been long cultivated to provide a substitute for saffron, and is widely spread in Victoria, though not particularly common. It is a non-hairy branched annual growing 1 to 3 feet high. The absence of prickles and hairs on the plant, in conjunction with the orange flowers, are sufficient to identify it.

BLUE CORNFLOWER (Cornflower).

Botanical Name.—Centaurea cyanus L.

A garden plant which occasionally escapes as a weed. Although unimportant, at present, as far as Victoria is concerned, it has become an undesirable weed in other countries, and any infestation should be promptly suppressed.

AFRICAN THISTLE.

Botanical Name.—Berkheya rigida Thunb.

This hairy, thistle-like plant has become established around Port Phillip during recent years, and should be eradicated where found. The heads are small, stalked, and spiny; the flowers are yellow, the bracts are woolly, with a terminal point (not a spine), and with paired spines near the base; the leaves are irregular-margined, spiny, white on the under surface, and 2 to 4 inches long.

OXTONGUE (Oxtongue Thistle, Yellow Oxtongue).

Botanical Name.—Picris echioides L.

Heads stalked, in forked groups. Rough and prickly but not spiny.
Flowers yellow.
Bracts broad, pointed, with stiff prickly hairs.
Leaves broad, with pimply white raised spots (tubercles), carrying stiff hairs. Upper leaves clasping the stem.

An annual or biennial weed of pastures, orchards, &c. Another species, Hawkweed-Picris (*Picris hieracioides* L.), which is biennial, may be conveniently bracketed with Oxtongue. Both reach a maximum height of about 3 feet, have yellow flowers, tubercles bearing stiff hairs, &c.

Proclaimed for some shires in Victoria.

Control Measures

From the point of view of control, the thistles fall into two main groups:—(1) the perennials, and (2) the annual or biennial group. Members of the former are more difficult to eradicate as far as the single plant is concerned, but those of the latter often more than make up for their short life by heavy seed production and the presence of a feathery apparatus, called the *pappus*, which enables the seed to be carried long distances by wind and water.

The first-named group includes the Perennial (Californian) Thistle, Artichoke Thistle, Purplish Cornflower, Knapweed, and Hardheads, while the strictly annual species are the Saffron Thistle, Malta Thistle, St. Barnaby's Thistle, Sacred Thistle, Syrian Thistle, Safflower, and the Glaucous Star Thistle. The biennial thistles are Star Thistle, Spotted Thistle, Spear Thistle, Slender Thistle, Stemless Thistle, Scotch (Heraldic) Thistle, Crisped Thistle, and the Golden Thistle. Many of these may be annual or biennial.

Fig. 13.—Oxtongue Thistle.
[Flora of Sth. Aust.

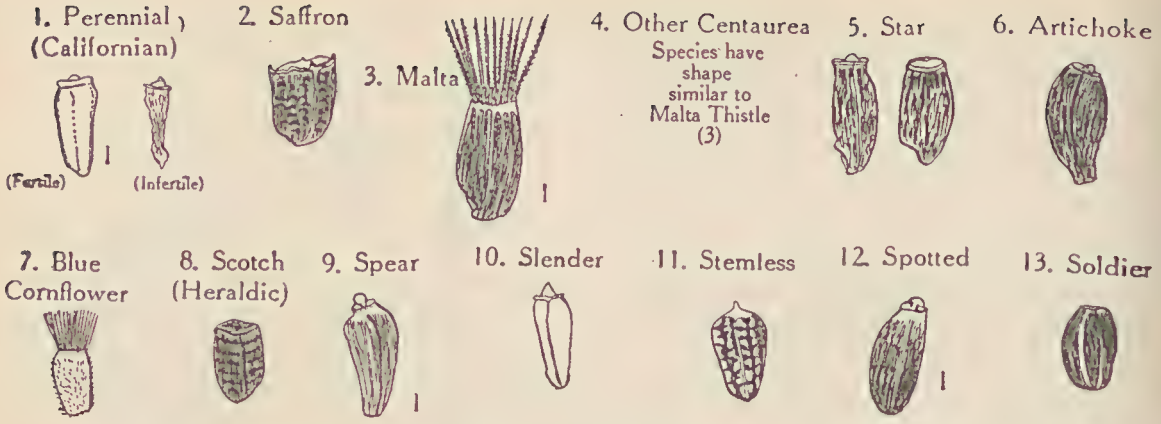

Fig. 14.—Showing the shape of the seed of various thistles. (Variously enlarged.)

The perennials offer the hardest problem in control, because of the necessity for destroying the root system as well as the top growth, and in this respect the type of farm on which the weed occurs may be an important factor; for example, it is impossible to suggest any satisfactory method of dealing with a deep-rooted perennial thistle in an old-established orchard or citrus grove, where even cultivation close to the trees requires hand labour and where irrigation may be necessary. Similarly, some annual thistles seed at the same time as the crop (e.g., saffron thistle in wheat), or have the power to form new flowers so close to the ground after the bulk of the plant has been mowed with, say, grass hay, that the formation of seed can not be prevented except by arduous hand labour with mattock or hoe.

The Perennial (Californian) Thistle is most troublesome. Unless pressed for food, stock usually neglect it, and except on small patches, chemical treatment is too expensive at present. The most practical method of dealing with it on pasture land is to attempt to build up the legume content with subterranean clover or white clover, choosing the species according to the rainfall and other local conditions, and to promote their vigour, and that of the pasture as a whole, by adequate phosphatic manuring. Thorough, but not prolonged, grazing of the pasture at fairly regular periods, according to the feed, and supplementing this by cutting, will help to prevent the distribution of seed. Such methods will not eradicate the pest, but, if persisted with, will reduce it to inconsiderable proportions. Cutting late towards the flowering stage is practically useless; to diminish the vigour of the plant it must be hoed early and often. By persistent effort the root-system can be starved out, but few people are willing to put the necessary time and labour into the job.

Small patches in both cultivated and grass land have been eradicated by smothering with strong tarred paper, or by the use of carbon bisulphide sealed in holes punched or bored at regular intervals throughout the patch. Other chemicals which have been employed are sodium chlorate, common salt, and arsenical sprays.

Large infestations on cultivated land may be kept in check by more intensive cultivation methods, but there is an added risk of spread of the weed by the distribution of pieces of roots. The aim in such cases is more to take off a profitable crop than to effect any permanent reduction of the weed.

The Artichoke Thistle does not present the same problem in control because it spreads only by seed, so that it can be checked by the prevention of seeding, and the plant root-system can be destroyed by fewer hoeings. Because of its large spread it is usually necessary to use a slasher to remove the top-growth before hoeing. Old plants must be removed with a mattock or chisel-ended pick, or even dug out, as the roots become very strong and woody. If such cutting is delayed until the stems are well developed, seed may be produced, and it is often necessary to pile and burn the thistles.

The annual and biennial thistles are more easily eradicated insofar as the plant is concerned, although in many cases the rapidity with which they spread makes delayed control a very laborious and expensive business. All

the annuals may develop as biennials under favorable circumstances, or if flowering is prevented. The essential feature of control is early hoeing, taking care that *all* the main roots are cut. The common Spear Thistle, for example, often has more than one main root, and if all are not severed the production of seed may occur after hoeing. It is cheaper to do the hoeing between the rosette stage and the commencement of flowering, except of course where only a few are becoming established, when they should be dealt with in the rosette stage. On a large scale, ploughing and cultivation have to be resorted to. Spraying is recommended only when thistles have got to the flowering stage and it is necessary to ensure that no viable seed will be produced. Any cheap herbicide carefully applied, with a follow-up treatment for those showing any sign of recovery, will be satisfactory with the annual species.

Another important preventive measure is the sowing of clean seed. The seeds of the various thistle species are illustrated in Fig. 14, which should serve as a guide to prospective purchasers of grain for seeding purposes.

Appendix

The Vermin and Noxious Weeds Branch of the Department of Lands and Survey, Victoria, has issued a chart with recommendations for chemical control of noxious weeds. The following table has been extracted from the chart, which is obtainable free on application to The Superintendent, Vermin and Noxious Weeds Branch, Lands Department, Melbourne, C.2.

Common Name.	Botanical Name.	Sodium chlorate.		Calcium chlorate.		Arsenic pent-oxide.		Arsenate of Soda.		Atlacide.		Remarks.
		Sodium chlorate.	Water.	Calcium chlorate.	Water.	Pent-oxide.	Water.	Arsenate.	Water.	Atlacide.	Water.	
		lb.	gal.	lb.	gal.	gal.	gal.	gal.	gal.	lb.	gal.	
Artichoke thistle ..	*Cynara Cardunculus* L. ..	1	1	..	..	1	9	..	..	2	1	Spray on foliage, soaking centre growth
Illyrian thistle	*Onopordon Illyricum* L. ..	1	1	..	..	1	9	..	..	1	1	Spray in rosette stage
Malta thistle	*Centaurea melitensis* L. ..	½	1	..	..	1	19	1	39	1	1	Spray before seeding
Perennial or Californian thistle	*Cnicus arvensis* L. ..	1	1	..	..	1	9	..	..	2	1	Spray when flower develops, and re-spray growths
Sacred (Blessed) thistle ..	*Cnicus benedictus* L. ..	½	1	1	1	1	29	1	59	1	1	Spray before flowering
Saffron thistle	*Kentrophyllum lanatum* DC.	½	1	1	1	1	29	1	59	1	1	Spray before flowering
Star thistle	*Centaurea Calcitrapa* Jacq...	1	1	..	..	1	10	1	20	2	1	Spray in rosette stage
St. Barnaby's thistle ..	*Centaurea solstitialis* L. ..	1	1	..	..	1	10	1	20	2	1	Spray in rosette stage
Syrian thistle	*Cirsium syriacum* Gaertn. ..	½	1	1	1	1	29	..	..	1	1	Spray in rosette stage
Terrible weed	*Centaurea paniculata* L. ..	1	1	..	..	1	9	..	..	2	1	Spray before flowering stage
Glaucous Star thistle ..	*Carthamus glaucus* Breb. ..	1	1	2	1	1	19	1	39	2	1	Spray in rosette stage
Golden thistle	*Scolymus hispanicus* L. ..	1	1	2	1	1	19	1	39	2	1	Spray before flowering
Hard-head thistle ..	*Centaurea repens* L. ..	1	1	..	..	1	9	1	19	2	1	Spray in full leaf-growth
Scotch (Heraldic) thistle	*Onopordon Acanthium* L. ..	1	1	2	1	1	19	1	39	2	1	Spray in rosette stage
Shore thistle	*Carduus pycnocephalus* Jacq.	1	1	2	1	1	19	1	39	2	1	Spray in rosette stage
Spear thistle	*Carduus lanceolatus* Scop. ..	1	1	2	1	1	19	1	39	2	1	Spray in rosette stage
Spotted thistle ..	*Carduus Marianus* L. ..	1	1	2	1	1	19	1	39	2	1	Spray in rosette stage
Stemless thistle ..	*Onopordon acaulon* L. ..	1	1	2	1	1	19	1	39	2	1	Spray in early rosette stage

List of Fungicides, Insecticides, Vermin Destroyers, and Weed Destroyers Registered at the Office of the Director of Agriculture under the Fungicides Act 1935 (No. 4295) for the Year 1946.

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).				Manufacturer or Wholesale Dealer.
	Arsenic Pentoxide (As_2O_5) Calculated on the Dry Basis.		Acidity Calculated as Nitric. Dry Basis.	Content of Water.	
	Total.	Water Soluble.			
Arsenate of Lead (Paste).	Minimum. %	Maximum. %	Maximum. %	Maximum. %	
Aero	31·5	·25	·2	50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Hipple	32·0	·50	·2	50·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Berger's Mercury	31·0	·50	·2	50·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
" (Colloidal)	31·0	·50	·2	50·0	" " " " " "
Blue Bell	31·0	·50	·2	50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	31·0	·50	·2	50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	50·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Ramtre	31·5	·25	·2	50·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo	32·0	·50	·2	50·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	32·0	·50	·2	50·0	Law, Somner Pty. Ltd.. 21–23 Elizabeth-street, Melbourne
Victor	32·0	·50	·2	50·0	F. R. Mellor, 452 Queen-street, Melbourne
Pannifex's	31·0	·50	·2	50·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne, N.1
Paka	32·0	·50	·2	50·0	Fruit Packers Associated Pty. Ltd., 395 Collins-street, Melbourne
Arsenate of Lead (Powder).					
Aero	31·5	·25	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Hipple	32·0	·50	·2	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	31·0	·50	·2	..	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Cooper's Arsinette	31·0	·50	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	31·0	·50	·2	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	31·0	·50	·2	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Ramtre	31·5	·25	·2	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane	31·0	·50	·2	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	32·0	·50	·2	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	32·0	·50	·2	..	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Sigma	32·0	·50	·2	..	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Victor	32·0	·50	·2	..	F. R. Mellor, 452 Queen-street, Melbourne
Berger's Mercury	31·0	·50	·2	..	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Pannifex's	31·0	·50	·2	..	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Calcium Arsenate.					
Hipple	40·0	..	..	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Elephant	40·0	..	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	40·0	..	..	..	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	40·0	..	..	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	40·0	..	..	..	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Sigma	40·0	1·00	..	..	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne

Sulphate of Copper (Bluestone).		%	
Blyth's	Copper (Cu)	25·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Jaques'	,,	25·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Macclesfield	,,	25·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne, C.1
Neptune	,,	25·0	,, ,, ,, ,, ,, ,, ,,
Neptune Snow	,,	25·0	,, ,, ,, ,, ,, ,, ,,
Pannifex	,,	25·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Vallo (Lump)	,,	25·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
,, (Neige Crystals)	,,	25·0	,, ,, ,, ,, ,, ,, ,,
,, (Powdered)	,,	25·0	,, ,, ,, ,, ,, ,, ,,
,, (Bordeaux Manufacture)	,,	25·0	,, ,, ,, ,, ,, ,, ,,
E.S.A.	,,	25·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Hart's Sugar Bluestone	,,	25·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hipple	,,	25·0	Horticultural Industries Pty Ltd., 67 Burnley-street, Richmond

	Percentage Copper (Cu).	Percentage Copper (Cu) Water Soluble.	Percentage through 200-mesh Sieve.	
Basic Copper Carbonate.	%	%	%	
I.C.I. A.N.Z.	52·0	Nil	99·0	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street Melbourne
Smutol (Oxychloride)	52·0	Nil	99·0	
Vallo Anti-Bunt (Oxychloride)	52·0	Nil	99·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Cuprox (Oxychloride)	50·0	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Soltosan (Oxychloride)	50·0	..	..	G. W. Allan, Fassett, and Johnson Ltd., 328 Flinders-street, Melbourne
Elliott's Bunticide	50·0	..	..	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Vallo Copper Spray	50·0	..	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne

Dry Bordeaux Mixture (Powder).		%	
Hipple	Copper (Cu)	12·50	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Lion	,,	12·50	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Vallo	,,	12·50	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	,,	12·50	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Burgundy or Copper-Soda.		%	
Neptune Copper Spray	Copper (Cu)	12·5	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Blue Bell	,,	12·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	,,	12·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Paris Green.		%	
Lion	Arsenious Oxide (As_2O_3)	55·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Felton, Grimwade, and Duerdin's	,, ,, ,,	50·0	Felton, Grimwade, and Duerdin's Ltd., 342–6 Flinders-lane, Melbourne
Tip Top	,, ,, ,,	50·0	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Hipple	,, ,, ,,	50·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Ramtre	,, ,, ,,	55·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Moon	,, ,, ,,	53·0	,, ,, ,, ,, ,, ,, ,, ,,

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Miscellaneous.	%	
Hipple Cheshunt Compound	Copper (Cu) 3·8	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Cooper's Bordinette	,, 12·7	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Lime.	%	
Vallo Selected	Available Lime (CaO) 80	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Neptune	,, ,, ,, 80	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne

	Thio-Sulphate Sulphur.	Poly-Sulphide Sulphur.	Total Soluble Sulphur.	
	Weight in Volume.			
Concentrated Lime-Sulphur (Solution).	%	%	%	
Hipple	2·5	20·0	28·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	2·5	20·0	28·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	2·5	20·0	28·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion	2·5	20·0	28·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	2·5	20·0	28·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Pannifex	2·5	20·0	28·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Vallo	2·5	20·0	28·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L.	2·5	20·0	28·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Tip Top	2·5	20·0	28·0	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Victor	2·5	20·0	28·0	F. R. Mellor, 452 Queen-street, Melbourne

	Sulphur.	Calcium Hydrate.	
Lime and Sulphur (Dry Mix).	%	%	
Pannifex	62·5	35·5	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Vallo	64·0	35·6	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L. Sulph. and Agral	66·0	33·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Sulphur.	%		
Commonwealth (Dusting)	Sulphur 90·0		Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
,, (Powdered)	,, 99·5		,, ,, ,, ,, ,, ,, ,, ,,
,, (Atomic Dusting)	,, 90·0		,, ,, ,, ,, ,, ,, ,, ,,
,, (Atomic)	,, 99·5		,, ,, ,, ,, ,, ,, ,, ,,
,, (Wetomic)	,, 97·0		,, ,, ,, ,, ,, ,, ,, ,,
Flotox (Wettable)	,, 95·0		H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Lion (Atomic)	,, 95·0		Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune (Powdered)	,, 99·0		Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Vallo (Powdered)	,, 99·5		Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
,, (Dusting)	,, 90·0		,, ,, ,, ,, ,, ,, ,, ,,
,, (Wettable)	,, 98·0		,, ,, ,, ,, ,, ,, ,, ,,
,, (Colloidal)	,, 50·0		,, ,, ,, ,, ,, ,, ,, ,,

Sulphur—continued		
Ramtre (Dust No. 39)	„ 90·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Wetsul	„ 97·0	„ „ „ „ „ „ „ „
Plane (Dusting)	„ 90·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Blue Bell (Colloidal)	„ 50·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant (Colloidal)	„ 50·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Hipple (Dusting)	„ 90·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Tromax (Sublimed)	„ 99·0	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Spregan	„ 55·0	Spregan Colloidal Sulphur Pty. Ltd., 90 Queen-street, Melbourne
Nicotine Sulphate.	%	
Hipple	Nicotine 40	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	„ 40	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Cooper's	„ 40	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	„ 40	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Lion (Black Leaf 40)	„ 38	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Plane	„ 40	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Vallo	„ 40	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top (Black Leaf 40)	„ 40	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Black Leaf 40 (Neptune)	„ 40	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Neptune	„ 40	„ „ „ „ „ „ „ „
Grazcos	„ 40	The Graziers' Co-operative Shearing Co. Ltd., 90–92 William-street, Melbourne
Sigma	„ 40	Sigma Co. Ltd., 562 Little Bourke-street, Melbourne
Hart's	„ 40	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Nik-kof	„ 40	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Watters	„ 40	Watters and Sons Pty. Ltd., 217 Queen-street, Melbourne
Ramtre	„ 40	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Coles	„ 40	G. J. Coles & Co. Ltd., 282 Little Collins-street, Melbourne
P.D.S. (Black Leaf 40)	„ 40	Producers Co-op. Distributing Society Ltd., 180 Franklin-street, Melbourne
Tar Distillate.	%	
Cooper's Ovicide	Tar Oils 48 Phenols 10 Mineral Oil 20	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo Ovicidal Wash	Emulsifiable Oils 89	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
I.C.I. (A.)	Tar Oil 70	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Blue Bell	Emulsifiable Oils 89	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	„ „ 89	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Hipple	„ „ 89	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Benzol Emulsion.	%	
Hipple	Benzol 30	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Vallo	„ 30	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Tip Top	„ 30	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
White Spraying Oil or Emulsion.	%	
Hipple	White Mineral Oil 80·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	„ „ „ 82·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Cooper's Alboleum	„ „ „ 80·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Elephant	„ „ „ 82·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	„ „ „ 82·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Kleenup	„ „ „ 83·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Lion	„ „ „ 80·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune	„ „ „ 84·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
„ (Clarifol)	„ „ „ 85·0	„ „ „ „ „ „ „ „
Vallo	„ „ „ 82·5	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Volck	„ „ „ 83·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Shell White Spray	„ „ „ 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
X.L.	„ „ „ 80·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Tip Top	„ „ „ 80·0	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Vacguard	„ „ „ 82·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Atlantic	„ „ „ 86·0	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne, C.1.
Atlantic Emulsified	„ „ „ 72·0	„ „ „ „ „ „ „ „

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Pale Spraying Oil.	%	
Gargoyle	Pale Mineral Oil 82·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Neptune Paisol	,, ,, ,, 85·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Shell Pale-Spray	,, ,, ,, 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Shellicide D.	,, ,, ,, 85·0	,, ,, ,, ,, ,,
Vallo	,, ,, ,, 82·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Red Spraying Oil.	%	
Hipple	Red Mineral Oil 85·0	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Blue Bell	,, ,, ,, 85·0	Blyth Chemicals Ltd., 31 Queen-street, Melbourne
Elephant	,, ,, ,, 85·0	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Gargoyle	,, ,, ,, 85·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Gargoyle Mayonnaise	,, ,, ,, 82·5	,, ,, ,, ,, ,,
Lion	,, ,, ,, 80·0	Orchard Sprays Pty. Ltd., 549 Church-street, Richmond
Neptune "A"	,, ,, ,, 85·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
,, "C"	,, ,, ,, 70·0	,, ,, ,, ,, ,,
Shell Red Spray "A"	,, ,, ,, 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
,, ,, "C"	,, ,, ,, 70·0	,, ,, ,, ,, ,,
Tip Top	,, ,, ,, 70·0	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Vallo	,, ,, ,, 86·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
X.L.	,, ,, ,, 85·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Pannifex	,, ,, ,, 83·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Atlantic	,, ,, ,, 89·0	Atlantic Union Oil Co., Ltd., 396 Collins-street, Melbourne, C.1.
Winter Spraying Oil.	%	
Shell Universal Winter Spray	Nitrated Phenols 85·0	Shell Co. of Australia Ltd., 163 William-street, Melbourne
Winsol	,, ,, 82·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Vallo D.N.C.	,, ,, 85·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Crude Spraying Oil.	%	
Neptune	Mineral Oil 85·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Vallo	,, ,, 83·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Miscellaneous Spraying Oil.	%	
Neptune Heavy Base	Mineral Oil 84.0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
Arsenic (Oxides).	%	
Vallo (White)	Arsenic (As_2O_3) 98·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
,, (Pentoxide) Granulated	Arsenic Pentoxide (As_2O_5) 83·0	,, ,, ,, ,, ,,
Hart's	,, (As_2O_3) 99·5	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Felton, Grimwade, and Duerdin's	,, ,, 98·0	Felton, Grimwade, and Duerdins Ltd., 342–6 Flinders-lane, Melbourne

		%		
Snail and Slug Killers.				
Bug-Geta	Metaldehyde	1.5	..	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Slugamort	,,	3·5	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Meta Sure Death	,,	1·5	..	Carl A. Schache, 2A Lunan-avenue, Drumcondra, Geelong
Defender	,,	1·25	..	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Eat-N-Die	,,	1·0	..	Kag Manufacturing Co., 4 Wood-street, Fitzroy
Shift-It	,,	1·25	..	Shift-It Products, 4 Roden-street, West Melbourne
Slugtox	,,	1·0	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Brown Magic	,,	1·0	..	E. H. Page, 1264 High-street, Malvern
Instant 265	Metaldehyde / Arsenic (As_2O_5)	1·4 / ·75	..	M. A. B. Grant, Beaconsfield
K.O.4	Metaldehyde / Sodium Fluosilicate	1·0 / 10·0	..	A. B. Gibson and Sons Pty. Ltd., cr. Stubbs and Robertson streets Kensington
Slug-Em	Aluminium Sulphate	20·0	..	Kag Manufacturing Co., 4 Wood-street, Fitzroy
Miscellaneous.		%		
Felton, Grimwade, and Duerdin's Formalin	Formaldehyde	38·0	..	Felton, Grimwade, and Duerdins Ltd., 342-6 Flinders-lane, Melbourne
I.C.I. A.N.Z. Carbon Bisulphide	Carbon Bisulphide	99·0	..	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Vallo (Orchard Tree Bands)	Beta-Naphthol	20·0	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Shirlan "A.G."	Salicylanilide	25·0	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
	Sulphonated Organic Matter	25·0		
,, W.S.	Sodium Salicylanilide	98·0	..	,, ,, ,, ,, ,, ,, ,, ,,
,, (100%)	Sodium Salicylanilide	100·0	..	,, ,, ,, ,, ,, ,, ,, ,,
Ceresan	Mercury	1·5	..	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Hortosan D.P.	Organic Mercurial Compounds	5·0	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Germisan	Sodium salt of / Cyan-mercury cresol / Sodium chloride	30·0 / 60·0	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Lunasan	Organically combined mercury	·54	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Agrosan	Organically combined mercury	1·5	..	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Nu-Green	Organically combined mercuric mercury	1·5	..	G. W. Allan, 328 Flinders-street, Melbourne
Aretan	Methy - oxy - ethyl - mercuric chloride	3·5	..	,, ,, ,, ,, ,,
Zetan	Hydroxy mercuri Nitro-phenol / ,, ,, Chloro-phenol	12·0 / 2·0	..	,, ,, ,, ,, ,,
Tuberol	Stearoptenes and Oleoptenes	70·0	..	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Champion Manurial Insecticide and Fungicide	Naphthalene	10·0	..	,, ,, ,, ,, ,, ,, ,, ,,
	Stearoptenes and Oleoptenes	3·0		
	Tar Acids	1·0		
	Sulphur	3·0		
	Copper	·6		
Grenedeth	Nicotine	0·58	..	E. H. Page, 1264 High-street, Malvern
	Sulphur	18·19		
	Paradichlorobenzene	2·27		
	Residual Oil	4·22		
	Napthalene	2·60		
Clensel	Oil of Citronella	2·0	..	Clensel Products Pty. Ltd., Youell and Cowper streets, Footscray
	Ammonia	2·3		
	Potash Soap	60·0		
Killamite Manurial Insecticide	Phenol	2·5	..	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
	Naphthalene	2·5		
	Hydrocarbon oils	5·0		
,, ,, ,, (Fine)	Phenol	1·25	..	,, ,, ,, ,, ,, ,, ,, ,,
	Naphthalene	1·25		
	Hydrocarbon oil	2·5		
Fluorocide	Sodium Aluminium Flouride	90·0	..	Sulphates Pty. Ltd., 395 Collins-street, Melbourne
Bi-chlorofix	Orthodichlorobenzene	2·8	..	Graziers' Co-op. Shearing Co. Ltd., 90 William-street, Melbourne
	Hycol	11·2		

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Miscellaneous—continued.		
Poultry Louse Powder	Sodium fluosilicate .. .. 12·5 Tar salts .. .. .. 2·5 Sulphur .. .. .. 2·5 Tobacco dust .. .. ·4	Jen's Vet. Products, 443 Little Collins-street, Melbourne
Nicotine Dusting Powders.	%	
Plane Nicodust No. 3	Nicotine .. .. .. 3·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Elephant Duston No. 1	,, ... 4·00	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Ramtre No. 4	,, ... 2·00	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, No. 5	,, ... 3·00	,, ,, ,, ,, ,, ,, ,, ,,
,, No. 6	,, ... 4·00	,, ,, ,, ,, ,, ,, ,, ,,
Vallo N.40	,, ... 2·50	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Victory	,, ... 3·00	R. H. Nankervis, 317 St. Kilda-street, Middle Brighton
Pinnacle Tobacco Dust	,, ... 1·00	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Coles Tobacco Dust	,, ... 0·60	G. J. Coles and Co. Ltd., 282 Little Collins-street, Melbourne
Arsenical Dusting Powders.	%	
Plane "A.P." No. 25	Arsenic Pentoxide (As_2O_5) .. 7·75	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, "A.P." No. 50	,, ,, ,, .. 15·5	,, ,, ,, ,, ,, ,, ,, ,,
Ramtre No. 17	,, ,, ,, .. 8·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
,, No. 19	,, ,, ,, .. 16·0	,, ,, ,, ,, ,, ,, ,, ,,
Vallo "A.L." 50	,, ,, ,, .. 16·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Pannifex No. 6	,, ,, ,, .. 7·75	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
,, No. 8	,, ,, ,, .. 15·5	,, ,, ,, ,, ,, ,, ,, ,,
Nictar	,, ,, ,, .. 15·5	P. Alkemade and Sons, 535 Little Lonsdale-street, Melbourne
Perfection	,, ,, ,, .. 23·5	S. G. Marriott, Ferntree Gully-road, Notting Hill
,, 50	,, ,, ,, .. 16·0	,, ,, ,, ,, ,, ,, ,, ,,
Victory No. 1	,, ,, ,, .. 23·5	R. H. Nankervis, 317 St. Kilda-street, Middle Brighton
,, No. 2	,, ,, ,, .. 15·5	,, ,, ,, ,, ,, ,, ,, ,,
Miscellaneous Dusting Powders.	%	
Plane Coppodust	Copper (Cu) .. .. 8·75	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Ramtre No. 14	,, ... 8·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Banexe	Tar Oil .. .. .. 5·6	D. Walker, Waverly Lime Works, Lara
Plane Peamite No. 1	Nicotine .. .. .. 1·00 Tar Oil .. .. .. 4·00	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
,, ,, No. 2	Nicotine .. .. .. 2·50 Tar Oil .. .. .. 4·00	,, ,, ,, ,, ,, ,, ,,
Victory Bordeaux ..	Copper (Cu) .. .. 8·0	R. H. Nankervis, 317 St. Kilda-street, Middle Brighton

	Nicotine.	Arsenic Pentoxide (As_2O_5).	Copper (Cu).	Sulphur.	
Miscellaneous Dusting Powders—continued.					
	%	%	%	%	
Elephant Duston No. 2	1·2	5·0	..	..	Jaques Pty. Ltd., 31 Queen-street, Melbourne
Plane "A.P." No. 25N	2·0	7·75	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" "A.P." No. 25N_2	3·0	7·75	..	..	" " " " " "
" "A.P." No. 50N	2·0	15·5	..	..	" " " " " "
" "A.P." No. 50N_2	3·0	15·5	..	..	" " " " " "
Ramtre No. 9	2·0	8·0	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" No. 30	2·0	11·0	..	..	" " " " " " " "
" No. 33	3·0	11·0	..	..	" " " " " " " "
" No. 42	2·0	13·0	..	..	" " " " " " " "
" No. 43	3·0	13·0	..	..	" " " " " " " "
" No. 52	2·0	16·0	..	..	" " " " " " " "
" No. 53	3·0	16·0	..	..	" " " " " " " "
" No. 54	4·0	16·0	..	..	" " " " " " " "
Vallo N 3-AL 30	3·0	9·6	..	..	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Perfection Arsenico-Nico Dust No. 1 ..	3·0	8·0	..	..	S. G. Marriott, Ferntree Gully-road, Notting Hill
" " " No. 2 ..	2·0	16·0	..	..	" " " "
Victory Dual Control	3·0	7·75	..	..	R. H. Nankervis, 317 St. Kilda-street, Middle Brighton
Ramtre No. 45	2·0	..	..	40·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Plane Azurine No. 2	..	..	7·0	40·0	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 4	..	..	11·0	35·0	" " " " " "
" " No. 20 with Lead Arsenate	..	6·2	7·0	40·0	" " " " " "
" Tomato No. 50	..	15·5	4·0	40·0	" " " " " "
" " No. 25	..	7·75	4·0	40·0	" " " " " "
Ramtre No. 21	..	6·0	6·0	30·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Vallo Tomato and Vegetable No. 1 ..	..	16·0	5·0	40·0	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
" " " No. 2 ..	..	8·0	5·0	40·0	" " " "
Ramtre Dust No. 13	..	..	5·0	25·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Perfection Bordeaux	..	..	9·0	..	S. G. Marriott, Ferntree Gully-road, Notting Hill
	Rotenone %				
Derris Dust No. 1	0·85	..	..	..	Houghton and Byrne Pty. Ltd., 263 Flinders-street, Melbourne
Plane Rotodust No. 125	1·25	..	..	..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
Cooper's Pulvex	1·0	..	..	..	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
" Drymac	1·0	..	..	..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" Katakilla	4·0	..	..	..	" " " "
Pestox	0·8	..	..	..	Samuel Taylor Pty. Ltd., 66 Hardware-street, Melbourne
*D.D.T. Dusts.**				%	
Pespruf No. 1	D.D.T.	.. ..	..	1·0 ..	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
" No. 2	"	.. ..	..	2·0 ..	" " " " " " "
Cooper's Deedust	"	.. ..	..	2·0 ..	" " " " " " "
Victory D.D.T. Dust	"	.. ..	..	2·0 ..	R. H. Nankervis, 317 St. Kilda-street, Middle Brighton
Horto-KIX	"	.. ..	..	2·0 ..	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Plane Noxide No. 200	"	.. ..	..	2·0 ..	N. N. McLean Pty. Ltd., 395 Queen-street, Melbourne
" " No. 100N ..	D.D.T.	.. ..	..	1·0 ..	" " " " " "
	Nicotine	.. ..	..	1·0	
" " No. 100N_2 ..	D.D.T.	.. ..	..	1·0 ..	" " " " " "
	Nicotine	.. ..	..	2·0	

LIST OF FUNGICIDES, ETC., ETC.—*continued.*

Distinguishing Name of Fungicide and/or Insecticide.	Percentage of Declared Active Constituent(s).		Manufacturer or Wholesale Dealer.
		%	
*D.D.T. Solutions.**			
Pespruf No. 20 Emulsion	D.D.T.	19·5	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Emulsion Base No. 200	,,	20·0	Taubman's Pty. Ltd., 24 Lonsdale-street, Melbourne
Agro–KIX No. 20	,,	20·0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
,, ,, No. 10	,,	10·0	,, ,, ,, ,, ,, ,,
X–Termin–All	,,	2·5	Wright, Stephenson and Co. (Aust.) Pty. Ltd., 34 Queen-street, Melbourne
K.F.M. Emulsion	D.D.T.	4·8	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Lysol	15·1	
	Ortho-dichlorbenzene	15·1	
Blowfly Preparations.			
Allkon Blowfly Oil	Arsenic (As_2O_3)	1·3	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Phenol and Homologues	22·2	
	Ortho-di-chlor-benzene	5·9	
	Hydro-carbon Oils	20·0	
	Naphthalene	7·5	
Bio-Fli-Di	Benzol	13·7	The Nightingale Supply Co. Ltd., Ingles-street, Port Melbourne
	Sulphur	·8	
	Tar Oil	8·4	
	Hydro-carbon oils	84·0	
Shell Defiance Blowfly Oil	Coal Tar Derivatives	13·0	The Shell Co. of Australia Ltd., 163 William-street, Melbourne
	Essential Oils	3·0	
	Arsenic (As_2O_3)	1·3	
Immunol Blowfly Dressing	Phenol and Homologues	22·2	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Ortho-di-chlor-benzene	5·9	
	Hydro-carbon Oils	20·0	
Way-blo	Eucalyptus Oil	33·33	W. K. Burnside Pty. Ltd., 34–44 Jeffcott-street, Melbourne
	Phenol and Homologues	2·77	
	Chlorinated Benzene	5·55	
Glycerine Di Boric	Boric Acid	21·5	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Osblo	Phenol	2·5	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
	Eucalyptus	·75	
Wilmo	Tar Oil	55·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Tetrachlorethylene	5·0	
Rudduck's Blowfly Dressing	Bone Oil	47·0	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
	Phenol	3·0	
Immunol C.B.E.	Boracic Acid	10·0	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Oil of Camphor	13·5	
Vetamac	Boric Acid	8·0	A. H. McDonald and Co. Pty. Ltd., 566–574 Bridge-road, Richmond
	Zinc Sulphate	1·0	
	Tar Oils	2·0	
	Essential Oils	1·0	
Calarsenite	Arsenious Oxide	43·0	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Mag-o-Tol	Cresylic Acid	4·0	Goldsbrough, Mort and Co. Ltd., 526 Bourke-street, Melbourne
Mag-o-Tol, plus D.D.T	Cresylic Acid	4·0	,, ,, ,, ,, ,, ,, ,,
	D.D.T.	·5	
Welco	Residual Vegetable Oil	20·0	Welch, Perrin, and Co. Pty. Ltd., 48 Queen's Bridge-street, South Melbourne
	Mineral Oil	80·0	
	Hydrocarbon Oils	84·0	
Squatter Blowfly Oil	Coal Tar Derivatives	13·0	Neptune Oil Co. Pty. Ltd., 163 William-street, Melbourne
	Essential Oil	3·0	
	Boracic Acid	30·0	
Wilmoff B.T.B.	Tar Oil	2·0	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Mineral Oil	2·0	
	Potassium Diborate	10·0	
Boranella	Tetrachlorethylene	5·0	,, ,, ,, ,, ,, ,,
	Citronella Oil	5·0	
	Boric Acid	15·0	
Benkersol	Kerosene	8·6	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
	Lysol	6·2	
	Ortho-dichlorbenzene	5·2	

* The D.D.T. content as shown is in terms of the para para isomer of dichloro-diphenyl-trichlorethane.

Imunmol B.T.B. 15 Blowfly Dressing ..	Boric Acid 81 parts to Oil 100 parts ..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Wilmoff B.K.B.	Boric Acid .. .. .. 2·5 Lysol .. .. .. 6·2 Mineral Oil .. .. 8·6 Ortho-dichlorbenzene .. 5·2	.. Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Immunol B.K.B.	Boric Acid .. .. 40·0 Cresol .. .. .. 6·7 Orthodichlorobenzene .. 14·2	.. Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Atlantic	Eucalyptus Oil .. .. 10·0 Cresylic Acid .. .. 11·3	.. Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
Grazcos Flyacide	Boric Acid .. .. 15·0 Tar Oil .. .. 2·0	.. Graziers' Co-op. Shearing Co. Ltd., 90 William-street, Melbourne
Blackers	Eucalyptus Residual Oil .. 50·0 Napthalene .. .. 5·0 Fish Oil .. .. .. 3·0 Cresylic Acid .. .. 2·5	.. Estee–Austramax Pty. Ltd., 51 Hardware-street, Melbourne
Weevil Destroyers.	%	
Vallo Arsenate of Soda (for treatment of hides)	Arsenic Pentoxide (As_2O_5) .. 63·0	.. Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Younghusband's Weevil Killer	Arsenic Pentoxide (As_2O_5) .. 63·0	.. Younghusband Ltd., 94–96 King-street, Melbourne
Vacuum Weevil Oil	Pale Mineral Oil .. .. 82·0	.. Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
Shell Weevil Oil	Mineral Oil .. .. 85·0	.. The Shell Co. of Australia Ltd., 163 William-street, Melbourne

Distinguishing Name of Vermin Destroyer (Sheep Dip).	Percentage of Declared Active Constituent(s).	Manufacturer or Wholesale Dealer.
Sheep and Cattle Dips (Arsenical).		
Cooper's Powder	Conforms with standard (Vic. Dept. of Agric.)	New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
Little's Powder (Ordinary)	,, ,, ,, ,, ,,	Wilcox, Mofflin Ltd., 499 Little Collins-street, Melbourne
Quibell's Powder	,, ,, ,, ,, ,,	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne.
Sickle Powder	,, ,, ,, ,, ,,	Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne
Vallo	,, ,, ,, ,, ,,	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Lan-o-leen	,, ,, ,, ,, ,,	The Graziers' Co-op. Shearing Co. Ltd., 90–92 William-street, Melbourne
Viper Powder	,, ,, ,, ,, ,,	Osmond and Son (Aust.) Ltd., 35 William-street, Melbourne
Kleanflok	,, ,, ,, ,, ,,	J. H. Rudd and Co. Pty. Ltd., 103–105 William-street, Melbourne
Vetamac	,, ,, ,, ,, ,,	A. H. McDonald and Co. Pty. Ltd., 566 Bridge-road, Richmond
Kleanfleece	,, ,, ,, ,, ,,	J. H. Rudd and Co. Pty. Ltd., 103–105 William-street, Melbourne
Young's Powder	,, ,, ,, ,, ,,	Strachan and Co. Ltd., Geelong
Miscellaneous Sheep and Cattle Dips.	%	
Cooper's Quickacting Powder	Arsenic (As_2O_3) .. .. 22·00 Rotenone and allied substances ·70	.. New Zealand Loan and Mercantile Agency Co. Ltd., 538 Collins-street, Melbourne
,, Milk Oil Fluid	Phenol and Cresol .. .. 18·00	.. ,, ,, ,, ,, ,, ,, ,, ,,
Hart's Immunol Super ..	Arsenic (As_2O_3) .. .. 24·5 Cresol .. .. 33·4 Oleo-resin (Derris) .. .. ·82	.. Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Kymac	Cresols .. .. .. 58·00 Rotenone and allied substances 1·30	.. Younghusband Ltd., 94 King-street, Melbourne
Little's Liquid	Arsenic (As_2O_3) .. .. 12·20 Tar Acids .. .. .. 13·00	.. Wilcox, Mofflin Ltd., 34 King-street, Melbourne
,, Fluid	Tar Acids .. .. .. 19·00	.. ,, ,, ,, ,,
Quibell's Liquid	,, ,, ... 18·00	.. Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
Vallo Fluid	,, ,, ... 18·20	.. Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
Young's Universal Paste ..	Phenols .. .. .. 25·80 Arsenic (As_2O_3) .. .. 13·5	.. Strachan and Co. Ltd., Geelong
,, Red Label	Phenols .. .. .. 24·00 Arsenic (As_2O_3) .. .. 15·00 Tubatoxins .. .. 19·50	.. ,, ,, ,, ,,
Osmond's Ivory Fluid	Tar acids .. .. .. 18·00	.. Osmond and Son (Aust.) Ltd., 35 William-street, Melbourne
Sickle Double ction	Arsenic (As_2O_3) .. .. 21·00 Rotenone and allied substances ·70	.. Commonwealth Fertilisers and Chemicals Ltd., 65 William-street, Melbourne

Distinguishing Name of Vermin Destroyer. (Sheep Dip).	Percentage of Declared Active Constituent(s).		Manufacturer or Wholesale Dealer.
Miscellaneous Sheep and Cattle Dips—cont.			
Kymac	Cresols	57·00	Elder, Smith, and Co. Ltd., Box 89, Geelong
	Rotenone and allied substances	1·33	
Quibell's Special Powder	Arsenic (As_2O_3)	21·60	Dalgety and Co. Ltd., 461–471 Bourke-street, Melbourne
	Rotenone and allied substances	·70	
Little's Supreme Powder	Arsenic (As_2O_3)	19·50	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
	Rotenone and allied substances	0·70	
Vallo Dual Purpose	Arsenic (As_2O_3)	23·00	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
	Rotenone and allied substances	·70	
Hart's Immunol Jetol	Arsenic (As_2O_3)	24·5	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Cresol	33·4	
	Derris Oleo-resin	·82	
Hart's Immunol Cresol Arsenical Fluid	Arsenic (As_2O_3)	24·5	,, ,, ,, ,, ,, ,, ,,
	Cresol	33·4	
	Alkyl Phenols	22·00	
Derris Fenol	Chlorinated Benzene	10·00	The Graziers Co.-op. Shearing Co. Ltd., 90 William-street, Melbourne
	Pine Oil	12·00	
	Derris Oleo-resin	2·00	
Immunol Derris Cresol	Cresol	60·00	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
	Derris Oleo-resin	1·50	
Allkon Derris Cresol	Cresol	60·00	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Derris Oleo-resin	1·50	
Udip	Arsenic	23·00	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
	Sulphur	73·00	
Allkon Arsenic Cresol	Arsenic (As_2O_3)	24·5	Allkon Pty. Ltd., 38 Clarendon-street, South Melbourne
	Cresol	33·4	
Vacdip Q	Arsenic (As_2O_3)	15·0	Vacuum Oil Co. Pty. Ltd., 29 Market-street, Melbourne
	Total Phenols	7·0	
Allkon	Arsenic	24·5	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
	Cresol	33·4	
	Derris Oleo-resin	0·82	
Weed Destroyers (Non-poisonous).		%	
Atlacide CA Solution	Sodium and calcium chlorates	25·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Laykold Weed Killer	Sodium Rhodonate	12·0	W. B. Carr Constructions, Arden-street, North Melbourne
Vertan	Sodium Chlorate	99·5	D. G. Officer Pty. Ltd., 90 William-street, Melbourne
Ramtre	,, ,,	98·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Weed Destroyers (Poisonous).		%	
Hippie	Arsenic (As_4)	60·6	Horticultural Industries Pty. Ltd., 67 Burnley-street, Richmond
Bell's Dandy Blue Weed Killer	,, ,,	55·0	Rocke, Tompsitt, and Co. Pty. Ltd., 292–298 Flinders-street, Melbourne
Cooper's Weedicide*	,, ,,	27·0	Ramsay and Treganowan Ltd., 475 Latrobe-street, Melbourne
Globe	,, ,,	59·0	Rocke, Tompsitt, and Co. Pty. Ltd., 292–298 Flinders-street, Melbourne
,, Weed and Scrub*	,, ,,	21·0	,, ,, ,, ,, ,, ,, ,,
Vallo Weed, Scrub, and Tree	,, ,,	60·6	Victor Leggo and Farmers Ltd., 222 Queen-street, Melbourne
,, Arzeen	,, ,,	60·6	,, ,, ,, ,, ,, ,, ,,
,, Liquid Arzeen*	,, ,,	36·3	,, ,, ,, ,, ,, ,, ,,
,, ,, Pentoxide*	,, ,,	23·5	,, ,, ,, ,, ,, ,, ,,
Tip Top	,, ,,	60·6	Law, Somner Pty. Ltd., 21–23 Elizabeth-street, Melbourne
Hart's Soluble Arsenic Liquid*	,, ,,	36·3	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
,, Killaweed*	,, ,,	30·0	,, ,, ,, ,, ,, ,, ,,
,, Pento Liquid*	,, ,,	23·5	,, ,, ,, ,, ,, ,, ,,
B.A.C.*	,, ,,	20·0	Carr Constructions, Arden-street, North Melbourne
Lion Weed Killer	,, ,,	60·6	Orchard Sprays Pty. Ltd. 549 Church-street, Richmond
Vetamac*	,, ,,	20·0	A. H. McDonald, 627 Bridge-road, Richmond

* In liquid form.

Melbourne, 25th March, 1946.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

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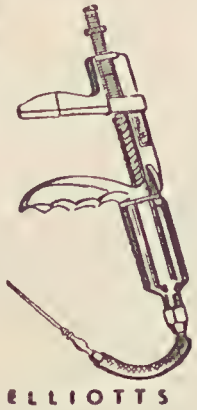

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THE POTATO CROP

Harvesting, Grading and Storing

By G. H. MATTINGLEY, *Potato Expert*

Typical potato-growing country in the Otway District

HARVESTING

THE harvesting of the Victorian potato crop extends over a considerable portion of the year. In the metropolitan market gardens digging commences towards the end of October. Digging continues right through the season until July, and even later in some seasons, so that harvesting takes place over at least nine months of the year. In occasional years digging actually has been done up to the end of September.

Except for the early crop, potatoes are allowed to mature fully before being dug. Unless handled carefully, immature tubers skin easily with consequent discoloration. In certain soils, particularly well-drained loams in the cooler districts, potatoes left in the ground until late in the season keep in excellent condition. However, this procedure has a big disadvantage in that it prevents cultivation being given to the paddock in preparation for a following crop, and encourages weed growth, thus adding to the difficulties and cost of digging.

Harvesting is done both by hand and machine. Where soil conditions are suitable, the latter is the more efficient and economical method. Working under the right conditions, the machine will dig faster, cleaner, and with less damage to the tubers than hand diggers, while, in addition, the machine is an ideal cultivator, leaving the soil in perfect order.

The digging machine favoured in Victoria is the elevator type. This operates with a lifting share set to a depth just lower than the deepest tubers, which forces soil and tubers on to an endless travelling chain which carries them to the rear of the machine. The chain is agitated by means of eccentric idler cogs, this motion pulverising the soil so that it drops through the links of the chain leaving only the tubers and tops to be delivered at the rear. One disadvantage

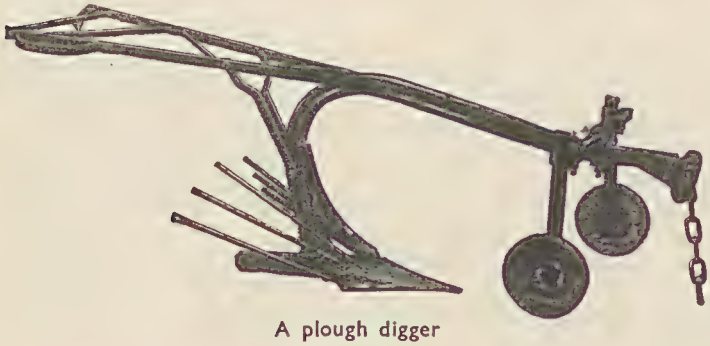
A power-driven potato digger in action

of the elevator digger is that it will not dig satisfactorily on a steep down grade. It does effective work on flat or gently undulating country.

Plough digging is sometimes resorted to, and a special double-winged share and prongs attached to a plough-beam are used for the purpose. This implement is suitable for light, friable soils, but not for heavy types of land unless these are in exceptionally loose condition.

Notwithstanding the efficiency of digging machines however, the bulk of the Victorian crop is harvested by manual labour.

Irrespective of the methods employed for lifting the crop, the heavy harrows should always be used after the bags have been carted off. This exposes practically all tubers which have been inadvertently covered and reduces trouble from self-sown plants in the succeeding crop.



A plough digger

GRADING

The grading of the crop is an important operation which is frequently neglected. In most cases grading is done in the paddock as the tubers are being bagged, the farmer being dependent on the skill of the casual labour employed for the purpose. Some growers cull out the small and damaged tubers in the field before storing in pit or barn. The potatoes are then hand-graded over a table before being sold, mechanical graders being used by some growers. The Victorian crop is marketed in three-bushel jute sacks which run about fifteen to the ton.

Grade Standards for Potatoes

Under the provisions of the *Fruit and Vegetable Act* 1928, potatoes must be graded into one or other of the following five grades, and the package must be legibly branded with the grower's name and address and the grade of the potatoes.

(1) Potatoes described as "No. 1 Grade" shall consist of sound potatoes of similar varietal characteristics having regard to colour, shape and general appearance, well-shaped, practically free from insect or fungous disease, or

damage caused by mechanical means, or blemishes, including second growth, frost, sunburn, greening through exposure, sprouting or other injury or deterioration, and practically free from dirt or other foreign matter. They shall have a mature skin and be not less than 2¼ inches in diameter or less than 3 ounces in weight.

(2) Potatoes described as "No. 2 Grade" shall comply with the standards of "No. 1 Grade" except as to maturity and size. They may have either a mature or immature skin and shall be not less than 1½ inches in diameter or 1½ ounces in weight, or more than 2½ inches in diameter or 3½ ounces in weight.

(3) Potatoes described as "New Potato Grade" shall comply with the standard of "No. 1 Grade" except as to maturity and size. They need not have a mature skin and shall not be less than 1¾ inches in diameter. No person shall sell potatoes in this grade during the months of March, April, May, June, July, August, September, and October.

(4) Potatoes described as "seed potatoes" shall consist of sound potatoes free from insect or fungous disease and practically free from dirt or other foreign matter. They shall be packed in packages legibly branded with the name of the variety of the potatoes and shall consist of 90 per cent. of the variety so named. The diameter of the tubers shall be not less than 1½ inches.

(5) Potatoes described as "stock food" shall be contained in packages legibly branded with the words "stock food" in letters of not less than 3 inches in height. No person shall sell such potatoes for table use or for seed purposes or for any other purpose except for use as food for stock.

STORAGE

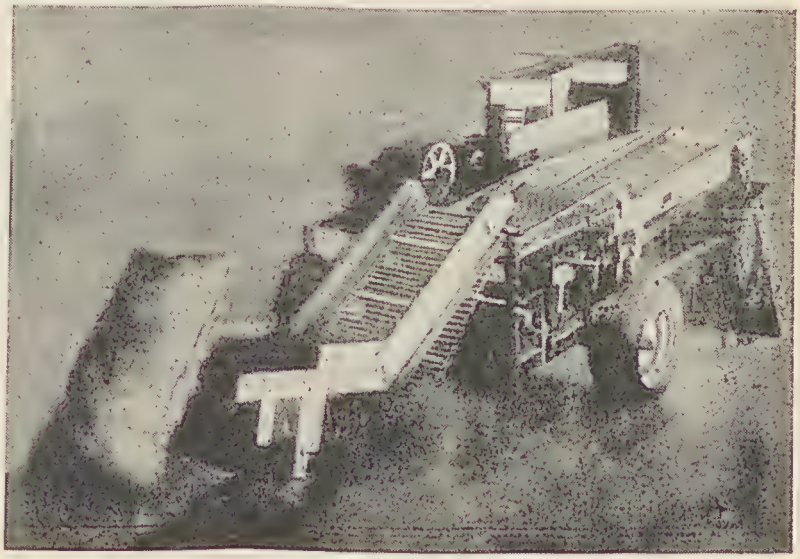
In Victoria, the early crops (which cannot be stored for long because of the immature state of the tubers) and the midseason crops, are sold out of the paddock, thus avoiding the need for storage on the farm. However, from May onwards in normal years the market for potatoes remains near saturation point, so that, to avoid gluts and consequent low prices growers are faced with the necessity of storing portion of their produce on the farms until later in the season.

If only for a limited period, table potatoes may be stored satisfactorily in bags in any dry, sheltered situation, provided steps are taken to exclude light and to ensure adequate ventilation. The best method of storing potatoes for extended periods is in "pits". By this means loss in weight and wastage are reduced, and less depreciation in condition and cooking quality are suffered.

Making a Pit

The site for the potato pit should be well-drained, and consideration should be given to its suitability as a location from which the tubers will be loaded for market.

A convenient width is from 6 to 8 feet and an effective way of framing this area is to plough inwards two parallel furrows so that the required width lies between them. The sods from the furrows act as checks which determine the size of the pile, while the furrows facilitate drainage. Logs or 6 x 1 hardwood planks, set on edge, are also suitable for forming the boundaries of the pit. The length will depend on the tonnage of potatoes to be stored.



A potato-grading machine

The potatoes should be built up as steeply as convenient—an angle of about 45° is practicable. As the pit progresses the sides and ends of the heap should be covered with a layer of straw about 4 inches deep. A capping of straw placed across the ridge so that the ends overlap the straw at the sides will shed any rain. Rye or wheat straw—or reeds where available—are preferable to oaten or barley straw as they are not so likely to consolidate and restrict the ventilation essential for safe storage.

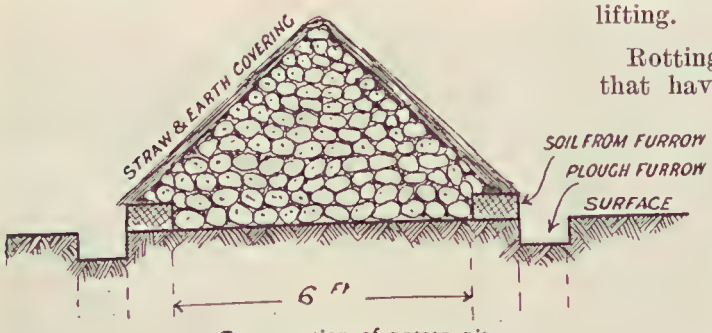
Potato storage pits.

The thatch may be secured against wind by a light covering of soil, or by rails or scantlings. If soil is used it should not be placed higher on the sides of the pit than 9 inches from the top of the ridge on either side. For small lots of one ton or less, the pit may be made with a circular base, and built up as high in the centre as the base will permit.

Storage Losses

It is important that growers should know the chief causes of waste in storage, so that these may be avoided. Potatoes should be carefully picked over and all diseased tubers removed before being stored. If diseased potatoes are mixed with sound ones, the higher humidity within the stack favours the development and spread of disease organisms to the surrounding healthy tubers.

Sweating and heating will occur if potatoes are stored in heaps so large that air cannot circulate between the tubers. The risk of loss from this cause is greatest with immature tubers, therefore potatoes intended for storage should be fully mature before lifting.



Cross section of potato pit.

Rotting will probably occur in potatoes that have been stored in a wet condition or which become wet during storage owing to inadequate cover. As potatoes are easily damaged by even a light frost, every precaution should be taken to protect them after harvest and during storage. Frosted potatoes are unfit for human consumption.

THE FLAYING AND CURING OF HIDES AND SKINS

By A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer, and* C. J. MORTON, *Senior Stock Inspector*

HIDES and skins are valuable by-products of the live stock industries of Australia, and to ensure that the greatest returns possible are obtained, it is essential that the best methods of skinning, curing, and marketing of the hides and skins be adopted.

The leather industries have all been built up on locally produced hides and skins. The hides and skins mainly used for the production of leather are those from cattle, goats, and sheep, and to a lesser extent those from horses and pigs.

There is a firm market for all hides and skins and the competition between overseas and local buyers is so keen that very good prices are received for all properly prepared consignments which are auctioned. Since early in the war all hides have been appraised and most of them have been accepted by the buyers to whom they have been allocated at the appraisal prices. Those not accepted have been auctioned. It is anticipated that the pre-war methods of auctioning and private selling will be reverted to in the near future.

In addition to the hides and skins used locally, considerable numbers are exported. The average number and value of cattle and horse hides and sheep and other skins sent overseas from Australia during the five years ended 1942–43 amounted to 22,079,093 and £4,415,819 per annum respectively.

NUMBER AND VALUE OF HIDES AND SKINS EXPORTED FROM AUSTRALIA.

—	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.
Cattle and Horse Hides and Calf Skins	1,186,543 (£896,752)	559,490 (£570,640)	496,415 (£138,648)	96,673 (£89,715)	72,526 (£49,156)
Sheep Skins with Wool	12,625,200 (£2,301,800)	9,242,953 (£2,267,779)	3,267,519 (£850,070)	8,442,352 (£1,755,419)	4,616,761 (£1,078,941)
Sheep Skins without Wool ..	1,075,895 (£68,152)	1,463,610 (£101,027)	2,013,651 (£127,666)	4,923,932 (£385,194)	3,643,179 (£307,477)
Rabbit Skins, &c.	£677,572	£1,157,518	£2,836,724	£3,742,273	£2,273,374

The number and value of hides exported during the war years diminished considerably, due to the increased local manufacture of leather goods, particularly boots and shoes for servicemen and servicewomen. Very large quantities of boots and shoes were exported for the use of the Dominion and Allied Services.

Farmers and country butchers, supply about one-quarter of cattle hides and sheep skins, and it is important that these should arrive in the best condition, so that the tanner may get the greatest quantity of good leather from them. Country suppliers of the raw material are, as a rule, large users of leather goods for harness, belting, boots and shoes, so that both as sellers of hides, and as buyers of leather, they are directly affected, and doubly interested.

Hides are often ripped off carelessly, without regard to final shape and little attempt is made to cure or preserve them.

Often the farmer sells hides to dealers, who may sell them in country centres, where they are further detained before being sent on to a hide merchant. Thus considerable time elapses before hides eventually reach the tanner. Owing to insufficient curing, such hides frequently arrive in a condition known as wet or "slippy", and are more or less putrid and little good leather can be manufactured from them.

Wetness or *Slippiness* is caused by decomposition and is common amongst hides which were flayed while the animals were hot and folded without adequate salting, and amongst hides from animals which had been dead for some time before skinning, as occurs amongst dead stock skinned on farms or removed to a boiling down works for skinning. Wet hides are weakened and produce poor quality, less valuable leather. They are also much darker in colour.

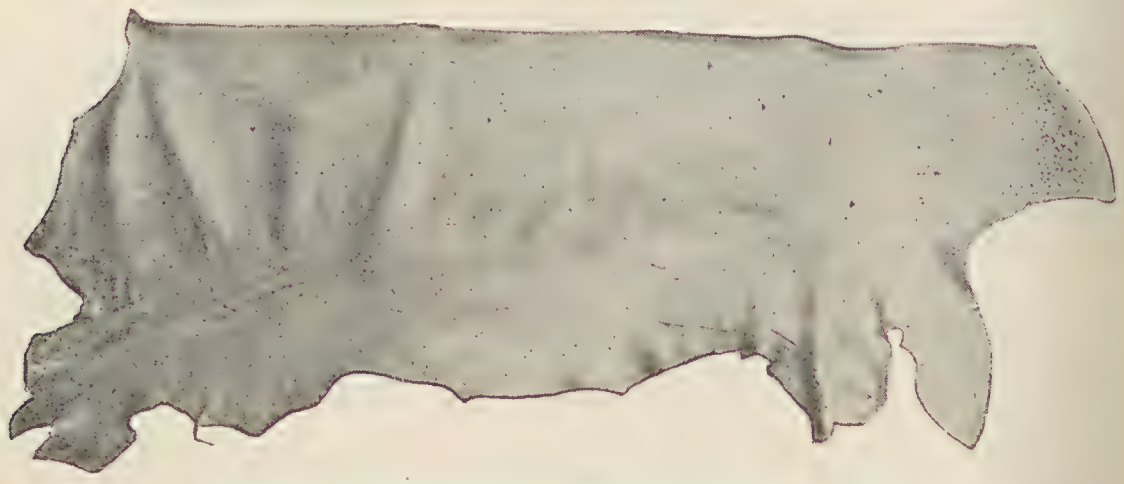
Uncleanliness reduces the value of the hide and it is advisable to clean the flesh side of dirty hides before salting.

All hides and skins must be kept clean, sound and well preserved, and should reach the tannery as quickly as possible.

Branding on the more valuable parts of a hide will depreciate its value considerably. If fire or acid branding is necessary, it should be done on the cheek for preference, then the neck, shoulder or lastly the flank. Leather of least value is produced on these parts.

The original calf brand may be comparatively small, but as the animal grows, the brand increases proportionately in size. A piece of branded leather cannot be used for footwear or machinery belting, as its tensile strength has been completely destroyed. In fire-branding the marks are frequently placed on the ribs or rump from which the best leather, called butt leather, is made, thus destroying one or two square feet of the most valuable part of the hide. Butts really are sides of leather with the necks, shoulders, flanks, and legs trimmed off.

Fire-branding is compulsory in most States, but in Victoria it is optional, and



Compare this well-flayed hide with the damaged specimen on right.

approximately 90 per cent. of the cattle are unbranded or have the brands located on the least valuable portion of the hide.

The Victorian United Cow Testing Association has inaugurated a tattooing scheme. The calves of the cows under test are identifiable so that records of the calves' ancestors can be readily traced. Tattooing which is done on the ears does not affect the hide at all.

Scores are cuts in the hide sufficiently deep to injure the grain of the leather, but not deep enough to be classed as a cut. Even clean, shapely, unsalted hides from abattoirs are often cut or scored. Scores are just as damaging as cuts.

Cuts reduce the size of pieces of leather obtained from the tanned hides. Scores and cuts may be caused when skinning by the operator or by barbed wire, horning, and injuries to the animals before death.

Many of these external injuries may be prevented by dehorning with caustic potash when the calf is a few days old, or by removing the horns from cattle over six months old with a dehorning instrument.

Fat and flesh left on the hide reduce its price per pound and increase its tendency to decompose. They are removed by fleshing before tanning.

Wherever possible animals should be skinned immediately they have been killed. Cattle and horses which have to be destroyed may be shot through the centre of the forehead with a shotgun, whereas it is customary to cut a sheep's throat as at the slaughteryards. At the slaughteryards cattle are usually stunned or pithed and immediately bled. All animals to be slaughtered for human consumption should first be rested, cooled down, and watered. The skin is apt to stick on overheated animals and be nicked or scored during its removal. There is less danger of scoring or cutting a hide that comes away freely.

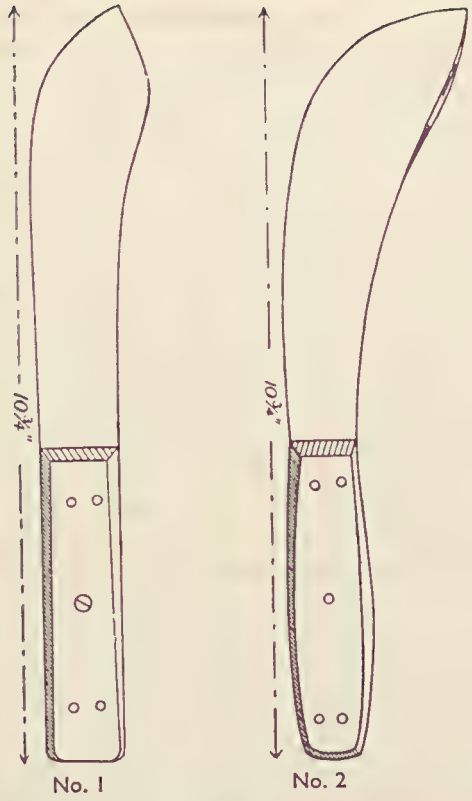
Two knives are desirable for skinning cattle. A pointed knife for pithing, opening up the skin and, if necessary, removing the head and feet, and a siding knife for removing the hide from the sides and back where long cuts can be made. Only the pointed knife is necessary for skinning sheep, as much of the skin is punched off. If only one knife is used for skinning cattle the pointed knife is used.

SKINNING AND DRESSING CATTLE

Mr. J. C. Marshall, a former Stock Inspector of the Department, described the method of skinning and dressing cattle and sheep by expert slaughtermen in the Journal of Agriculture, September, 1938, and his descriptions are repeated here.

The animal should be cleaned free of dirt and manure, and when it is killed the carcass should be moved to a clean place on which to be dressed. After the beast has been felled, by stunning or pithing, it should be bled. This is accomplished by making a deep incision into the neck. Then a long straight incision must be made from a point half-way between the breast-bone or sternum and

In this instance unskilful flaying has resulted in extensive damage being done to an otherwise good hide.



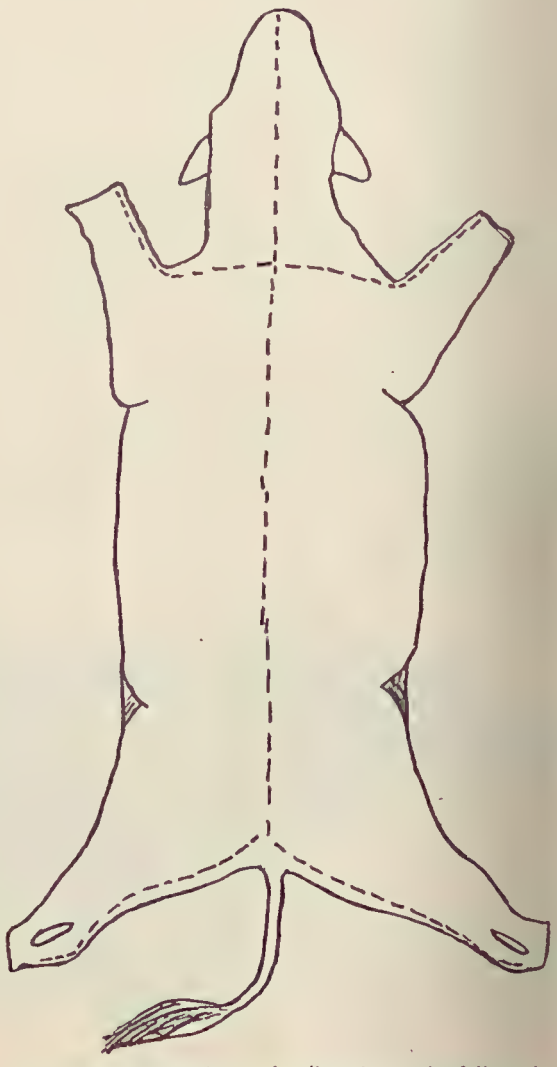
No. 1—Knife for pithing, sticking, and opening out the skin from legs, etc.
No. 2—Class of knife known as a "siding knife" and used for making the longer cuts, and strokes in siding and backing off. The siding knife is used mostly on cattle and big calves.
For dressing small calves and sheep two good knives like No. 1 will suffice.

throat, severing the skin along the median line for from 9 inches to 1 foot. The wind-pipe will be then exposed; this must be followed down towards the brisket point with the knife, keeping in deep, with the back of the knife on the wind-pipe until big blood vessels are encountered where they fork and at that point the artery and large vein are severed.

If a good stick be made the animal will bleed remarkably well and quickly. In the case of cattle the neck should never be cut, cross-wise. When the carcass has bled freely, the cheeks and face should be skinned and the head removed.

The beast must then be placed on its back and held in position by means of a short prop known as a "pritch" or else by placing a block on each side of the carcass. The legs are cut off at the knee and hock joints. The skin is then opened at the knee joints and the knife run in a direct line to the brisket and in the case of the hind legs from the hock to a point three inches behind the cod (purse). Next the hide is opened up from the crutch to the sticking cut in the neck.

The actual skinning process then commences. One of the main factors in flaying well, is to hold the hide up tightly with one hand and drive or thrust the knife with the other, cutting from heel to point. After opening the carcass out on the ground and skinning well down each side, the brisket



The dotted lines indicate the direction to be followed with the knife in order to get the best shaped hide. The figure represents a beast on its back.

and aitch bone are sawn through. It must then be partly raised from the ground by means of the tackle until the tail is about as high as the operator's shoulders. The tail should be removed and about six inches of tail skin left on the hide. Then proceed to remove or clear the bulk of the hide. Finish around the buttocks and side to the chine and back-bone on each side before completely raising the animal. (The beast is sufficiently raised when the neck is just clear of the floor.) After removing the entrails and chest contents, chop or saw down evenly through the middle of the back-bone from pelvis to neck and wipe the carcass with a clean damp cloth.

Correct opening of the hide

To do the best work, good tools are required. Proper knives are essential.

Country Hides

Country hides forwarded to market are often much inferior to those sent by butchers.

Note how efficiently the hide is being removed

At abattoirs only experts are engaged on the flaying process. Further, the abattoirs have one advantage in that hides are cleanly handled there and quickly marketed. From the bulk of the metropolitan abattoirs the hides are taken fresh daily, and the curing process, if required, is done at the hide and skin stores by qualified men; or else they are sold direct to metropolitan tanners and subjected to the tanning process forthwith. But all the blame for damaged hides must not be assigned to farmers and country butchers.

Hides from Abattoirs

Hides coming from abattoirs often show signs of scoring or nicking and have cuts and "cut outs". Expert butchers, of course, can take off the hides perfectly, but the work performed being mostly in the form of rush-work, the necessary time cannot be given to perfect flaying.

The method of flaying cattle hides as conducted at abattoirs lends itself to scoring. It is

around the region of the buttocks, rump, and tail that damage is effected while the beast is on the ground. Most butchers like to "slide" the animal and carry the work right around the buttock and even clear to the tail while it is on the ground. The work can be more quickly done while the animal is in this position, but it is often accomplished at the expense of the hide, for it is there that a good deal of nicking and scoring takes place. The work around this part would be done better, as far as the hide is concerned, when the beast is partly hoisted; although the carcass would not be so quickly dressed, the hide would get better treatment and the beef would look and be dressed equally as well. It may take a little longer, and in these days when wages for expert slaughtermen are high, time to most butchers is of more value than the loss due to the damage that may be inflicted on the hides.

Butchers' Hides

The treatment by country butchers of the tail-end of the beast is frequently at fault. Instead of skinning the tail carefully and well down from the rump to within six inches of the tip, it is often severed back into the rump with all its skin intact. No doubt the tail keeps fresher looking, and sells better for edible purposes with the skin on, but at what loss! At the expense of the ultimate shape of the hide; for the tanner has to sacrifice some of the most valuable portion of the butt to even up the hole made as the result of cutting the tail off with so much hide on it.

Country butchers' hides are sometimes better flayed than those from abattoirs, although improvement can be effected usually in their flaying. As a rule, however, these hides are not so well cured and are frequently dirty (carrying dirt, blood, manure, &c.), on reaching the hide stores.

Dead cattle should be skinned in much the same way by farmers and their employees as cattle at the abattoirs. Billets of wood may be used to prop the carcass on its back.

Unshapely hides and skins with ragged edges which occasionally arrive at city stores in a dirty and putrid condition mean loss to the producer. What should be aimed at is to get the hide from the beast as nearly square as possible, so that the tanner gets the maximum amount of leather with the minimum of loss especially in the way of trimmings.

Cattle hides and skins for tanning purposes are classed as follows:—

A skin weighing 7–16 lb. is called a calfskin

A skin weighing 16–30 lb. is called a kip.

A skin weighing 30–40 lb. is called a light-leather hide.

A skin weighing 40–70 lb. is called a medium hide.

A skin weighing 70–100 lb. is called a heavy hide.

A sheep skin (with wool removed) is called a pelt.

SKINNING AND DRESSING CALVES

A calf is skinned and the skin cured with salt in exactly the same way as a bullock hide, and the same precautions are necessary, particularly with regard to the skinning near the tail, where at least four to six inches of the tail should be skinned to prevent the skin splitting.

When the calves are being dressed on the farm for market, they should be slaughtered in the same way as bullocks by pithing or stunning and immediately bled by cutting the throat. The head is removed. The legs are removed at the knees and hocks. The tail should be left on.

The carcass is then hung up and the entrails removed, leaving the lungs and heart intact. After it is well cooled the carcass should be wrapped in a clean hessian bag and marketed as soon as possible. The skin is sold on the carcass.

CURING HIDES

The hide must be cleaned of blood, dirt, manure, or other debris, and allowed to cool thoroughly for at least two hours; length of time depending on climatic conditions. It should be laid out in a clean place hair side down and the flesh side liberally and evenly sprinked with coarse salt. The quantity necessary is about 15 lb. per hide, varying with the size. As a general guide about 1 lb. of salt should be used for every 3 lb. of hide. It is impossible to over-salt. More damage is caused by under-salting than is generally suspected. The salt used

should be clean, coarse, and free from foreign matter. Previously used salt should be avoided. The latter as a rule causes discoloration, frequently imparting a pinkish colour to the hide. In addition, it is not a good curative agent. The legs, neck, and edges of the hide require special attention, as they are the first to show the effects of bad and insufficient salting. If the hide is to be disposed of at once, it should then be folded by throwing one side over the other, and the outside edges folded back nearly to the centre with more salt being thrown on to the edges. The neck and tail ends are then folded over, each about one-quarter of the way towards the centre. The neck is again folded over and finally the tail end is folded again over the top to make a neat bundle.

Efficient, clean, and quick salting is necessary to prevent the hide from turning more or less putrid. Putrefaction causes the hair to fall or slip and makes the hide wet. Wet hides may be fit for making glue only. A well-cured hide is an even, light-grey colour.

If it is intended to store the hides to make one large consignment, they should be cleaned, and when the animal heat has escaped, placed in a large shallow concrete pit, the floor of which has been sprinkled with coarse salt. The hide should be laid in the pit flesh side up and sprinkled evenly with clean coarse salt. The next hide may be laid on top of the previous one and salted similarly. In the pit the hides make their own brine and become better cured, and will stand a journey to market better than the fresh-salted ones. After being in the pit for a fortnight or longer they may be lifted out to drain. When in twenty-four hours

1.—The hide laid out for salting, flesh side up. 2.—The hide being salted in preparation for folding. 3.—One side of the salted hide is folded over the other. 4.—The outer edges of hide are turned back almost to first fold. 5.—First the neck and then the tail are folded nearly a quarter-way from each end. The neck end is again folded almost half-way, followed by the tail end over the top of the other folds.

they firm up, and can be rolled and bundled as previously described, and securely tied with thin rope. Hides should never be tied with wire as it stains them.

Another method of treating hides is to place them in pairs, flesh sides together, after they have been well salted, when they may be bundled and allowed to cure.

Under no circumstances should alum be used with salt or on its own for curing hides, as it spoils them for wattlebark tanning.

Calf skins may be treated and folded in the same way as cattle hides. Two or three or more may be packed together to make a fair-sized bundle and tied firmly with strong twine or thin rope.

SKINNING AND DRESSING SHEEP

In the country, sheep and lambs are usually held over a rail on the floor, and stuck for bleeding purposes alongside the ear, by pushing the knife right through the skin on both sides of the neck and then turning the knife while in the neck and cutting backwards to the bone, almost severing the head. At abattoirs and country slaughter-houses variations of this method are adopted.

The sheep or lamb is then placed on its back with the four legs turned upwards, and the operator "legs" the animal, that is, he grasps the off fore-leg between his knees and from the knee-joint rips down to the neck. This is repeated with the other fore-leg, and little opening out is necessary. Before proceeding further he makes an incision in the neck to free the gullet, in which a knot is tied so that the contents do not escape. The piece of skin overhanging the brisket is next grasped in the left hand, and the right hand and arm pushed up under the brisket skin almost to the cod and forced each side in so doing. The hind-legs are alternately grasped between the operator's knees and the skin ripped down from hock to crutch and opened out slightly. The handle of the knife may be used in forcing the skin away from the opening made in ripping, to clear the legs near the tail. The gambrel should then be inserted between the hock joints and the animal's hams tring and hung on a hook. The hook should be just high enough to allow the carcass to hang clear of the floor. An even cut should be made from cod to neck down the length of the skin and the skin "fisted off" wherever possible. A little knifing in the flanks and around the tail is all that is required, and

Sheep skins drying under cover on well-aired racks.

if the animal is sappy, the skin will, when started right, peel off without much effort on the part of the operator. Great care should be taken to see that there is no nicking or scoring of the skin in the region of the flank. If this part be well taken off a much larger and squarer skin will be obtained by the tanner and a better price paid to the producer.

Curing Sheep Skins

Sheep skins immediately after removal from the carcass should be hung on rails or galvanized wire in a cool, draughty, shady place to dry. A large open or louvred shed makes a good drying place. They may be bundled together and sold or forwarded to market as soon as dry.

Destroying Weevils

If it is intended to keep sheep or furred skins on hand for any length of time, it will be necessary to spray or paint them with an arsenical preparation, in order to prevent the ravages of weevils or other vermin. A satisfactory spray can be made by adding 1 lb. arsenic and 3 lb. soda to 5 gallons of water, and then boiling the mixture; when dissolved make up to 15 gallons of water. If preferred, arsenate of soda, procurable at most country stores, may be used in the strength of 1 lb. to 5 gallons of water; another preparation can be made in the following way :—Dissolve 1 lb. arsenate of soda in 5 gallons of cold water; place 1 lb. bitter aloes in 2 gallons of water and boil until the aloes are dissolved, and add 1 pint of the aloes mixture to every 5 gallons of the arsenate of soda mixture. The spray is then ready for use on sheep, furred, or other dried skins.

Any preparation should, of course, be applied on the flesh side when the skin is dry or showing a crust. If applied to skins which are not properly dry, they lose their lustre.

Labelling of Consignments

All skin consignments should be clearly labelled to ensure prompt delivery. The name of the sender should also be shown on each package in each consignment. In addition the skin merchant or consignee should be advised by letter that the hides and skins have been forwarded. All of the larger skin merchants will supply labels and letter cards for this purpose.

PREGNANCY TOXÆMIA

Pregnancy toxæmia affects ewes during the last month of pregnancy. The exact cause is not clearly known; though the symptoms of this form of so-called "lambing sickness" is well known to most sheep men.

Affected ewes appear rather "dopey," and stand away from the rest of the sheep. They appear to be blind, frequently grind their teeth, and there is usually a yellowish discharge from the nostrils. In this state they remain for a few days, and then go down, become paralyzed and soon die. The most marked feature of post-mortem is the pale yellowish liver. The ewe is usually seen to be carrying twin lambs which accounts for the common name of the complaint, "twin-lamb sickness". The trouble usually occurs when there has been a decrease in the nutritional quality of the feed during pregnancy. It is possible to produce the disease by shutting up ewes heavy in lamb. Therefore, it is desirable to endeavour to maintain the standard of nutrition during the last month or so of pregnancy.

Treatment is not very successful, although drenching twice daily with a cup full of molasses may help early cases. Symptoms abate once the ewe has lambed. If cases should occur it would be worth while to supplement feed with any fodder available. The supply of molasses may also be of value. The disease may also occur in ewes running on soft green feed associated with insufficient exercise, and in this case dry feed should be provided, plus a certain amount of exercise during the last few weeks of pregnancy.

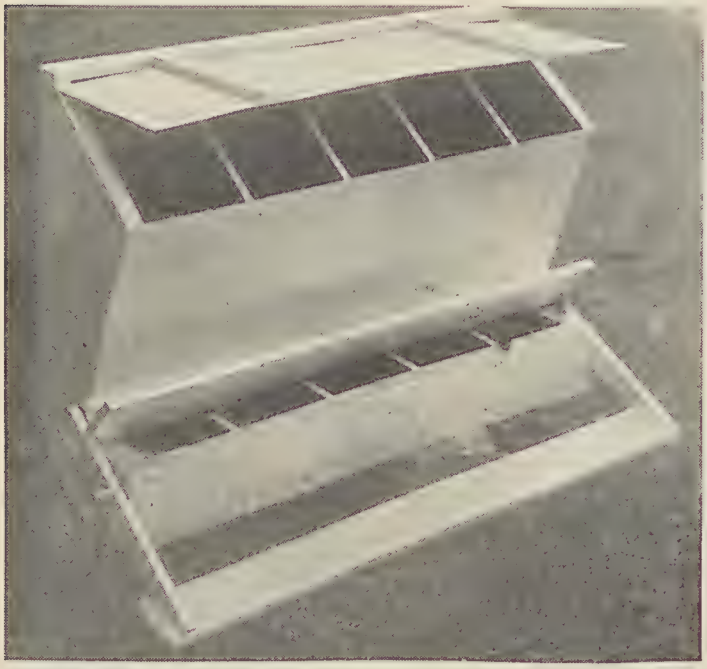
[Contributed by the Live Stock Division.]

AUTOMATIC HOPPERS *for* POULTRY FEEDING

By W. O. PEDERICK, *Assistant Poultry Expert*

FEEDING tests conducted at the State Research Farm, Werribee, and on commercial farms have proved that highest egg production is obtained when the birds are given as much food as they will eat. The idea that if laying fowls are given plenty of food they will become fat and lazy and cease to lay is unsound. In fact, when bred from a proved laying strain, the more food fowls can be induced to eat, the more eggs they are likely to produce.

The method of keeping food continuously before the birds can be recommended and either whole grain feeding or dry mash feeding may be practised.



Hopper used at Eurnley, for free choice feeding. Where mixed feed is used however, the partitions are unnecessary.

Whole Grain Feeding

With whole grain feeding, the ration consists solely of whole grain and meatmeal. Both the grain and the meatmeal should be available to the birds in separate hoppers at all times. A variety of grains should be provided by using two or more of the following grains—wheat, oats, maize and barley, either mixed together or in separate hoppers.

Constant supplies of succulent green feed are essential. It may either be chaffed and fed regularly each day or be used whole by placing it in a wire basket and allowing the birds to pick it out as they require it. Shell grit should always be available.

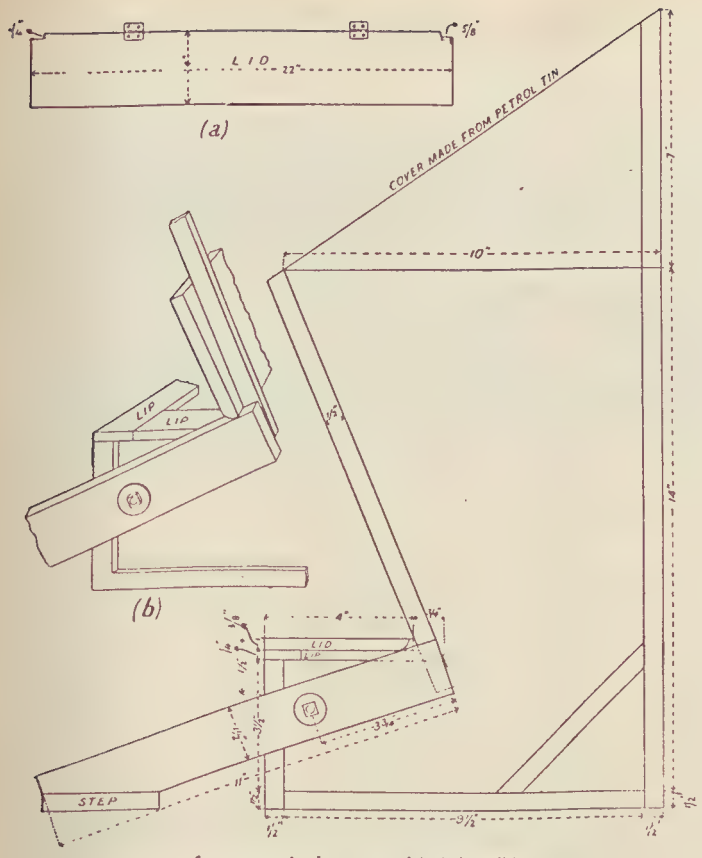
The system is particularly suitable to farmers and others running poultry as a side-line, being simple and labour-saving.

Dry Mash Feeding

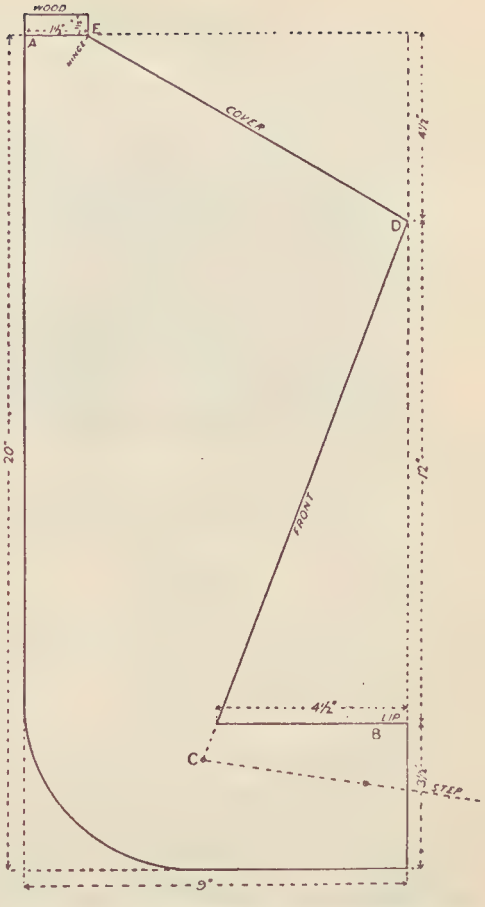
With this system the dry meals are mixed together and fed in hoppers to which the birds have access at all times. The grain ration is fed in the litter at evening, allowing the birds as much as they will eat comfortably, which is approximately 2 oz. per bird.

The following feed mixtures are suggested :—

Dry Mash.	lb.
Bran	30
Pollard	50
Maize-meal, oat-pollard or barley-meal	10
Meatmeal	10
or	
Meatmeal 5 lb. and Dried Buttermilk 5lb. ..	10
Salt	1



Plan of automatic hopper, (a) lid ; (b) step.



End view of hopper illustrated on previous page.

Grain.	lb.
Wheat	60
Oats	20
Maize or Barley	20

Chaffed green feed should be fed separately either at mid-day or preferably after the grain feed at night.

How to Make a Hopper

An illustration of a hopper appears on the previous page. The partitions shown in this hopper are used for free-choice feeding, but where mixed feed is used they are unnecessary. The illustration above shows the shape of the end of the hopper. The two ends are made of wood, and the remainder consists of three pieces of plain iron. One piece covers the back, bottom and front of the feed-trough from A to B ; the second piece covers the front from C to D ; and the third forms the cover from D to E, and is hinged on the top to a small piece of 1½ in. x ½ in. timber.

This hopper is usually about 20 inches long, but can be made any length, and can be partitioned off if required. The automatic step can be attached as shown in the plan of the hopper made from a kerosene case as illustrated above left.

A simple hopper can also be made from kerosene or petrol cases. The main part of the hopper is made from one case ; the top section consists of a quarter of a case, cut on the angle so that the birds cannot roost on it.

It may be hung on the wall about 2 ft. from the ground, and when the fowls jump on to the step the lid of the feeding trough will open.

A narrow lip about 1 inch wide is placed around the feeding trough to lessen the wastage of feed. An endeavour should always be made to construct the hoppers in such a way that waste of food will be reduced to a minimum.

Certified Pullorum-Tested Flocks (Poultry)

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the Journal of Agriculture.

Application forms are obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder:—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orphington.

Owner.	Breed.	Number of Birds.
Bartlett, N. M., Pimpinio	A, B	324
Batey, L. J., Katandra North	B	1,206
Becker, F. W., Follett-road, Cheltenham	A, B	559
Bray, J., 18 Hotham-street, Warrnambool	A, B	72
Christie, R. R. & Son, Bentleigh	A, B, C	587
Coleman, A. J., Mountain Highway, Bayswater	A, B	141
Corbett Bros., Noel-avenue, Macleod	A	2,164
Davidson, Mrs. A. C., 22 Sherbrooke-avenue, Ringwood	A, B	142
Dawson, R. G., Maldon-road, Castlemaine	B	1,442
Dookie Agricultural College, Dookie	A, B	597
Emmott, E. & T., Inglewood	A, B	283
Fellows, J., Yan Yean-road, Plenty	B	830
Gage, K. L., Clarke-road, Springvale	A, B	444
Gedye Bros., Railway-road, Blackburn	A, B	4,799
Giarrusso, G., Lower Dandenong-road, Braeside	B	770
Gibbs, Mrs. M. M., Yan Yean	C	71
Gilchrist, W. J., Rossiter-road, Koo-wee-rup	A, B	2,688
Gillespie, Mrs. L., Katamatite	A	128
Giovanetti, G. E., Skene-street, Kennington	A, B, C, D	385
Graham, C., Portarlington	A	88
Grenville, G. W., Springvale South	A, B, C	3,087
Grosvenor, E. W. & E. K., Springvale South	A, B, C	574
Gwyther, R. P., Valley-road, Highton	A, B	799
Hall, R. H., Wal Wal	A, B	884
Hall, W. S., Lyndhurst	A, B	955
Harding, T., Thomastown	A, B	3,518
Harrington, W. H., Golden Square	A, B	1,673
Harrison, Mrs. A. M., Cobden	A, B	93
Hayes, R., Mt. Dandenong-rd., Montrose	A, B	739
Henderson, C. W., Shepparton East	A	567
Henderson, W. R., 22 Chesterville-road, Cheltenham	A, B	110
Hewett, A. T., Central-avenue, Bayswater	A, B	1,349
Howard, A. P., Black Hill-road, Kyneton	A, B	1,299
Hurst, H., Eltham Hatchery, Eltham	B	1,583
Jenkins, A., Ridge-road, Kallista	A, C	524
Kemp, H. L., Whitehorse-road, Ringwood East	A, B	590
Kerr, J. J., Clarke-road, Springvale	B	1,422
Keyte, A. M., Private Bag 6, Natimuk	A, B	422
Kostos, D., Waverley-road, Oakleigh	A, B	1,839
Lang, John, 46 Dundas-street, Thornbury	E	74
Latta, H. J., Langwarrin	A	1,557
McTighe, C. H., Nar Nar Goon	A	444
Major, C. D., Simpson's-road, Eaglehawk	A, B	582
Mead, J. L., 28 Golf Links-avenue, Oakleigh	A, B	209
Mitchell, R. J., Alkooma Poultry Farm, Macleod	A	1,095
Molson, W. E., Blackburn	B	886
Moroney, J. B., Kangaroo Flat	A, B, C	1,673
Muir, J., Quabba Poultry Farm, Ringwood	B	1,239
Mumford, L. J., Steele-street, Healesville	A	400
Nemet, P., Springvale-road, Springvale South	B	2,622
Nichols, Mrs. Ella M., Yan Yean	C	513
Poulton, A. W., Vickers-street, Sebastopol	A, B	1,687
Power, M. J., 8 Danin-street, Pascoe Vale	A, B, C	858
Reher, P., Holmeglen Poultry Farm, Burwood	A	2,125
Rodgers, C., Panton Hill	B	97
Salathiel, R., Lockwood-road, Kangaroo Flat	B	642
Salmond, J. B., Deer Park	F	245
Sanders, A., Stud-road, Wantirna	A, B	428
San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,451
Sargeant, E. G., 261 O'Heas-st, Pascoe Vale	B, C	189
Scouller, R. C., Tarrant-street, Cobden	A, D	375
Smith, E., Valley-road, Highton	B	1,505
Smith, H. A., Marong-road, Malden Gully	B	1,391
State Research Farm, Werribee	A, B	1,176
Stiles Bros., Fair View Poultry Farm, Wallan	A, B	1,262
Swift, D. A., Kangaroo Flat	A, B	2,226
Taylor, H. R., Reservoir	A, B	2,519
Voight, A. H., Lawn-road, Noble Park	A, B	1,395
Walton, F. R., Woodvale-road, Boronia	A, B, C	403
Watters, N. J., 6 Alpine-grove, Pascoe Vale	A, B, C, E	139
Waugh, A. J., Kangaroo Flat	A, B	1,509
Webb, A. E. H., Frankston-road, Cranbourne	A, B	6,315
Welch, T. A., Bayswater-road, Bayswater	B, G	1,944
Wernli, J. H., Cheltenham	A, B, D	649
Whitham, R. S., 28 Neville-street, Glenhuntly	A, B	132
Williams, V., 91 Tone-road, Wangaratta	A, B	726
Winter, G. S., Murgheboluc	A, C	714
Wohlers, S., Box 17, Jung	A	261
Yates, W., 64 Bank-st., East, Ascot Vale	A	35

LIVE STOCK NOTES

Compiled By
A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Gestation Periods of Farm Animals

THE average gestation periods of farm animals are given on the following page so that farmers may feed and care for pregnant animals adequately and be prepared at the time of parturition to give any necessary assistance. The actual length of the gestation period varies considerably with individual animals of the same breed, and for this reason pregnant animals should be watched closely several days before they are due.

Amongst cattle at the State Research Farm, Werribee, it was found that Red Poll cows carried their calves three days longer than Friesian cows and that cows carried bull calves nearly one day longer than heifer calves. Twin calves were carried nearly 10 days less than single calves. The range of a normal gestation period is difficult to determine as some cows have carried their calves up to 318 days and, at the other end, abortion causes many short pregnancies, but calves carried for only 248 days have been reared successfully without any special treatment. However, the normal range appears to be from 275 days to 298 days with an average of 283 days.

The gestation periods of the different breeds of sheep also varies considerably. The coarse-wooled British breeds usually have an average gestation period of 147 days, whereas with the fine-wooled Merinos, it is usually 152 days. Similar variations are known to occur with other kinds of farm animals.

The gestation period is the time between mating and parturition. The approximate average gestation periods with the normal variations for the different kinds of farm animals are as follow :—

Mare	..	340 days (330–370).
Cow	..	283 days (275–298).
Ewe	..	147–152 days (140–161).
Doe (Goat)		150 days (136–157).
Sow	..	114 days (110–120).

With poultry the incubation period of the eggs varies less than the gestation period of mammals and seldom do eggs hatch more than 12 hours before or 12 hours after they are expected. This is partly due to the fact that eggs of even size and good shape are usually set. The size of eggs does cause variation in the period of incubation as does high temperatures at which eggs may be kept prior to

incubation. The incubation periods for different breeds of bantams vary from 17 days to 21 days,, which is the period for the ordinary fowl.

The incubation period is the time between the setting and hatching of the eggs. The average incubation period for the different kinds of poultry are as follow:—

Hens	21 days
Ducks (except Muscovy)	28 days
Turkeys	28 days
Geese	28 to 32 days
Muscovy Ducks ..	35 to 37 days

The Gestation Chart or Breeders' Table hereunder is based on slightly shorter periods than the average, but this gives the breeder greater opportunity to prepare for parturition.

Infertility in Pigs

Enquiries received from pig breeders show that there is considerable loss in the pig industry through sterility. In many cases sows which are thought to be close to farrowing are found to be not in-pig, which means, of course, that several months of time, food, and paddock room have been wasted.

Such loss could be reduced if written records of mating dates were kept and the sows were checked 21 days later so that failure to breed could be detected early.

There are many possible causes of failure to breed, and the cause may be with the boar or the sow in question. Deficiencies in their diet may cause sterility. If thoroughly investigated, the cause in any particular case may be determined, but the immediate problem for the pig-raiser to

Gestation Chart or Breeders' Table

Date of Service.	Date Due Sow (16 weeks).	Date Due Ewe (21 weeks).	Date Due Cow (40 weeks).	Date Due Mare (48 weeks).	Date of Service.	Date Due Sow (16 weeks).	Date Due Ewe (21 weeks).	Date Due Cow (40 weeks).	Date Due Mare (48 weeks).
Jan. 1	April 25	May 27	Oct. 8	Dec. 2	July 5	Oct. 27	Nov. 23	April 11	June 5
,, 6	,, 30	June 1	,, 13	,, 7	,, 10	Nov. 1	Dec. 3	,, 16	,, 10
,, 11	May 5	,, 6	,, 18	,, 12	,, 15	,, 6	,, 8	,, 21	,, 15
,, 16	,, 10	,, 11	,, 23	,, 17	,, 20	,, 11	,, 13	,, 26	,, 20
,, 21	,, 15	,, 16	,, 28	,, 22	,, 25	,, 16	,, 18	May 1	,, 25
,, 26	,, 20	,, 21	Nov. 2	,, 27	,, 30	,, 21	,, 23	,, 6	,, 30
,, 31	,, 25	,, 26	,, 7	Jan. 1	Aug. 4	,, 26	,, 28	,, 11	July 5
Feb. 5	,, 30	July 1	,, 12	,, 6	,, 9	Dec. 1	Jan. 2	,, 16	,, 10
,, 10	June 4	,, 6	,, 17	,, 11	,, 14	,, 6	,, 7	,, 21	,, 15
,, 15	,, 9	,, 11	,, 22	,, 16	,, 19	,, 11	,, 12	,, 26	,, 20
,, 20	,, 14	,, 16	,, 27	,, 21	,, 24	,, 16	,, 17	,, 31	,, 25
,, 25	,, 19	,, 21	Dec. 2	,, 26	,, 29	,, 21	,, 22	June 5	,, 30
Mar. 2	,, 24	,, 26	,, 7	,, 31	Sept. 3	,, 26	,, 27	,, 10	Aug. 4
,, 7	,, 29	,, 31	,, 12	Feb. 5	,, 8	,, 31	Feb. 1	,, 15	,, 9
,, 12	July 4	Aug. 5	,, 17	,, 10	,, 13	Jan. 5	,, 6	,, 20	,, 14
,, 17	,, 9	,, 10	,, 22	,, 15	,, 18	,, 10	,, 11	,, 25	,, 19
,, 22	,, 14	,, 15	,, 27	,, 20	,, 23	,, 15	,, 16	,, 30	,, 24
,, 27	,, 19	,, 20	Jan. 1	,, 25	,, 28	,, 20	,, 21	July 5	,, 29
April 1	,, 24	,, 25	,, 6	Mar. 2	Oct. 3	,, 25	,, 26	,, 10	Sept. 3
,, 6	,, 29	,, 30	,, 11	,, 7	,, 8	,, 30	Mar. 3	,, 15	,, 8
,, 11	Aug. 3	Sept. 4	,, 16	,, 12	,, 13	Feb. 4	,, 8	,, 20	,, 13
,, 16	,, 8	,, 9	,, 21	,, 17	,, 18	,, 9	,, 13	,, 25	,, 18
,, 21	,, 13	,, 14	,, 26	,, 22	,, 23	,, 14	,, 18	,, 30	,, 23
,, 26	,, 18	,, 19	,, 31	,, 27	,, 28	,, 19	,, 23	Aug. 4	,, 28
May 1	,, 23	,, 24	Feb. 5	April 1	Nov. 2	,, 24	,, 28	,, 9	Oct. 3
,, 6	,, 28	,, 29	,, 10	,, 6	,, 7	Mar. 1	April 2	,, 14	,, 8
,, 11	Sept. 2	Oct. 4	,, 15	,, 11	,, 12	,, 6	,, 7	,, 19	,, 13
,, 16	,, 7	,, 9	,, 20	,, 16	,, 17	,, 11	,, 12	,, 24	,, 18
,, 21	,, 12	,, 14	,, 25	,, 21	,, 22	,, 16	,, 17	,, 29	,, 23
,, 26	,, 17	,, 19	Mar. 2	,, 26	,, 27	,, 21	,, 22	Sept. 3	,, 28
,, 31	,, 22	,, 24	,, 7	May 1	Dec. 2	,, 26	,, 27	,, 8	Nov. 2
June 5	,, 27	,, 29	,, 12	,, 6	,, 7	,, 31	May 2	,, 13	,, 7
,, 10	Oct. 2	Nov. 3	,, 17	,, 11	,, 12	April 5	,, 7	,, 18	,, 12
,, 15	,, 7	,, 8	,, 22	,, 16	,, 17	,, 10	,, 12	,, 23	,, 17
,, 20	,, 12	,, 13	,, 27	,, 21	,, 22	,, 15	,, 17	,, 28	,, 22
,, 25	,, 17	,, 18	April 1	,, 26	,, 27	,, 20	,, 22	Oct. 3	,, 27
,, 30	,, 22	,, 23	,, 6	,, 31					

consider when his pigs fail to breed is—how long should he persevere with them in the hope of getting them to breed again.

A sow's value as a backfatter or chopper must be considered in relation to her value as a prospective, but doubtful breeder, and the cost of replacing her with another sow. After such consideration, it is usually found most economical to sell for slaughter the sows which fail to breed regularly and well, and to replace them with young sows.

Admitting that as a general rule the non-breeding sows should be quickly replaced, it is still advisable to investigate the cause of sterility so that the trouble may be averted in the future. Also, the need for replacing the boar should not be overlooked, when his stock-getting ability is in doubt.

[L. A. Downey, H.D.A., Pig Expert.]

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Poultry Breeding Notes

Each year some poultry breeders complain of infertility amongst their breeding stock, and that their best layers do not commence laying until late in the season, with the result that the progeny from these birds are slow to mature, and often of inferior quality. These troubles could be avoided to a great extent if closer and proper attention were paid to the breeding stock at the right time of the year.

Breeding from immature birds results in the production of many small, under-weight eggs, and if continued from year to year the average constitutional vigour of the whole flock may deteriorate. This fact should be grasped by every poultry farmer. Breeding from birds with high single-test records alone, without regard to size, constitutional qualities and other factors is also an error which is quite common. If stock are selected without all the desired qualities they will not reproduce birds capable of withstanding intensive conditions.

Eggs suitable for hatching should be carefully selected. The hatching of many crippled, deformed, and "dead-in-shell" chickens could be prevented if only normal-sized, good-shelled, and good-shaped eggs were set. The ideal egg should weigh not less than 2 ounces, and have a smooth shell of the proper thickness and be free from ridges and roughness. Eggs of stud stock should be gathered frequently, especially in bad weather. Frequent gathering will prevent the necessity for cleaning the eggs, which takes a good deal of time. Very dirty eggs should be cleaned before being placed in the incubator, but it is preferable to have the eggs clean from the nest. Eggs for incubation should be kept in a cool, well-ventilated room, and it is advisable to use them not more than approximately seven days old.

[H. F. Clinton, Poultry Expert.]

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Bee-keeping Notes

Re-conditioning of spare hives and frames and general repairs are the principal jobs to be carried out now. Under ordinary circumstances the hives should not be opened. The colony is now semi-dormant and formed into a compact mass for warmth and any disturbance would lower the temperature, causing the bees to eat more honey to raise the temperature to normal.

Hive covers should be examined and, where necessary, steps should be taken to see that they are correctly fitted and made weather-proof. Advantage should be taken on a cold, bleak day to turn over the earth directly in front of the hive entrances with the object of preventing an early growth of grass retarding the free ingress and egress of bees. In cold weather, the bees become wet and numbed when passing through wet grass at the entrances to the hives. Many numbed bees will fall to the ground and perish.

Migratory apiarists who usually move their bees to the coastal area for the early spring bloom of tea-tree and capeweed should not delay the movement, as the comparative warmth and freedom from heavy frosts in the coastal area, make better conditions for wintering.

[J. W. Thomlinson, Apiary Inspector.]

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Milk Fever in Dairy Cows

Milk fever is a complaint of dairy cows and is associated with an increasing paralysis and loss of consciousness often leading to coma and death in untreated cases.

The symptoms shown in milk fever are all due to a fall in the calcium or lime content of the blood. Why this fall should

come about has yet to be solved, although some scientists associate it with a possible disorder of the parathyroid glands which control calcium levels in the blood.

Cows affected are usually between 5 and 9 years old. The onset of symptoms is usually 12 to 72 hours after the birth of the calf, although attacks may occur prior to calving and sometimes months after calving. Affected cows are at first depressed and disinclined to move and, in typical cases, paralysis first affects the hind limbs. Difficulty in standing is followed by the animal going down after lying with a lateral kink in the neck, or with the head sometimes turned to the flank. The eyes are dull and staring, pupils dilated and there is a complete loss of appetite. The muzzle is dry and the extremities cool to touch.

Some cases may show an initial period of excitement with muscular twitchings and convulsive movements of the head and limbs. During an attack of milk fever bowel evacuations are suppressed and the anus is relaxed, while recumbent cases sometimes become "blown". The temperature is from 97° to 101°F. and the pulse 50 to 85 per minute.

Treatment consists of the administration of calcium borogluconate in a 20 per cent. solution with pure sterile water under the skin by means of a needle and syringe. A 20 per cent. solution can be made by dissolving a 2½-oz. packet of borogluconate in 12 ounces of boiled water. Such a dose would suffice for the average case. All needles and syringes should be boiled immediately prior to use, and the site of injection clipped and swabbed with iodine. Even with these precautions an abscess may result at times.

Some farmers use the udder inflation method of treatment which may give results when the borogluconate does not. (The reverse is also true.) When this method is used the teat should be swabbed with methylated spirits and teat siphons must be boiled. For preference the air should be pumped through some filter containing medicated gauze to lessen the risks of a following mastitis.

Cows which are known to be prone to milk fever can be protected by an injection of calcium borogluconate immediately after calving.

All instruments should be thoroughly cleaned and sterilized immediately after use, and re-sterilized before being used in a fresh case.

[R. D. Irvine, B.V.Sc., Veterinary Stock Inspector].

CHEESY GLAND (*Caseous Lymphadenitis*) OF SHEEP

Cheesy Gland is a disease of sheep occurring in most of the sheep breeding countries of the world except Great Britain.

The disease is important to us because Great Britain will not accept export lamb or mutton showing cheesy gland or carcasses from which any gland has been removed.

The disease is caused by a specific organism called *Coryne-bacterium ovis* which lives and multiplies in the soil as well as in sheep. Infection occurs through skin wounds particularly after shearing and lamb marking. Abscesses form in the superficial lymph glands which may burst and clean up. Quite frequently, however, they develop into a cold abscess containing greenish pus. Internal abscesses are also found in the liver, lungs, and spleen.

The disease is seldom noticed in the living animal but is found on slaughter. British breeds are believed to be more susceptible than merinos. There is no treatment.

Complete control is impossible, but scrupulous cleanliness in shearing sheds and a fresh yard for lamb marking will lessen the infection.

[Contributed by the Live Stock Division.]

TERMITES *(White Ants)*

AND THEIR CONTROL

By H. B. WILSON, B.Sc., A.A.C.I.,
Assistant Entomologist, Biological Branch

While it is not possible to assess the timber damage caused by the White Ant in the northern country of Victoria, it is recognized that in the aggregate, this pest causes severe damage, not only to farm dwellings, but also to sheds, barns, tank stands as well as fence posts.

Much of this damage is preventable and at very low cost, when white ants, their ways and their works are understood and the appropriate control and preventive methods are applied.

To place the farming community and others in possession of such information, this article has been written by Mr. Wilson, who is a recognized authority on termites, having spent a number of years on this work with the Forest Products Division of the Council for Scientific and Industrial Research, prior to joining the Department of Agriculture.

IN certain parts of Victoria timber is frequently attacked by destructive insects called termites or white ants as they are more popularly known. They occur more frequently in the drier parts of the State. Certain species abound in the mountainous areas, but in these regions most of the damage is confined to the centres of the trunks of growing trees and damage to structural timber is rare.

Nature of Damage

The appearance of termite damage is very characteristic and can be readily distinguished from the work of other insect pests of timber, which are usually associated under the one general term, "borers." Borers make regular tunnels which are circular or oval in cross section. Their presence is usually indicated by holes varying from $\frac{1}{16}$th to 1 inch in diameter in the surface of the affected wood.

Termites, however, excavate irregular galleries in the wood and they do not break the surface of exposed timber. Below ground level, as in the butt of a post, the wood may be eaten away from the outside surface, but in exposed timber above ground, the internal excavations or galleries are concealed by an outer unbroken surface of sound wood which may be only of paper thickness. These concealed galleries are difficult to detect and may only be revealed by the collapse of the damaged piece.

Termites will attack other substances besides wood. They have been known to penetrate and damage lead sheet, leather, bitumen, fabrics and other relatively soft materials. They also attack crops such as potatoes but this type of damage to crops is rare in Victoria and of no practical importance.

Appearance of Termites

Termites may sometimes be observed in damaged timber which has been broken open. They then appear as pale coloured slow moving wingless insects about $\frac{1}{4}$ inch in length.

During the spring and summer months, dark-coloured, winged, male and female termites may invade houses, particularly at night, when they are attracted to the light. They soon drop their wings and crawl about the floors and walls, disappearing into dark crevices. In the morning after such an invasion only the discarded wings will be seen. These flying termites are unable to attack timber. Their function is to establish new colonies, for which nests must be constructed in the soil, a laborious process requiring years of work, even under favourable conditions. Most of these flying forms are quickly destroyed by natural enemies, or by exposure. Those which do survive require more favourable conditions than are provided by the walls and floors of buildings, and the risk of damage to buildings as a result of some prior invasion by winged termites is so small that it can be ignored.

Fig. 1.—A typical Victorian termite mound.

[Drawing after C.S.I.R. photo.

Habits of Termites

(*a*) NESTS.—Termites which attack structural timbers in Victoria work from specially constructed nests in the soil. Subterranean tunnels up to 50 yards or more in length may extend from the nest in different directions to sources of food. The nest may be entirely hidden below the surface of the ground or it may be covered by an earthen mound (see Fig. 1). While termite mounds are usually conspicuous objects, subterranean nests are almost impossible to locate.

Termites live in large well-organized communities of which the nest is the headquarters. One nest may house more than one million individuals.

(*b*) METHOD OF ATTACKING TIMBER.—Termites travel between their nests and the timbers they are attacking through their tunnels in the soil. These tunnels may be extended above the ground by small earthen tubes about ¼ inch or more across, which may be built over masonry or metal surfaces to shelter the termites from exposure. These tubes may extend for several feet or more (see Fig. 2).

Termites may also build slender unsupported aerial tubes for a height of 12 inches or more vertically, to make contact with timber above the ground.

By means of this system of tunnels and tubes termites remain in constant contact with the nest, maintaining a free interchange of food and water between the members of the community.

Prevention of Termite Attack

In localities where experience has shown that termite attack is liable to be frequent and severe, it is better to prevent attack rather than to attempt to control it after it has started.

If certain measures are applied with careful attention to detail, they will effectively prevent termite attack. These methods are as follows :—

1. CONSTRUCTION OF CONCRETE SLAB FLOORS.—Concrete slab floors may be used for a variety of building types. They have been used for houses in northern Australia, but in Victoria their use is generally restricted to sheds, stores and similar structures. Properly constructed slab floors provide excellent protection against termites for buildings and their contents (see Fig. 3). The following points must be observed :—

(*a*) The floor must be a little larger than the building so that a concrete "apron" at least 3 inches wide extends all round the building.

(*b*) This apron must be kept free of debris and weeds, and should slope downwards to shed water.

(*c*) The construction joints in the floor must be treated with creosote oil by pouring it between the slabs to prevent termites entering through the joints. One gallon of creosote oil should be sufficient to treat 100 ft. of normal joint. The treated joints will remain repellent for a number of years.

(*d*) The soil against the slab edge may be puddled with creosote oil to form a repellent soil barrier 2 inches wide and 6 inches deep (see Fig. 4). A repellent barrier of these dimensions requires about 1 gallon of creosote for 6 ft. of treated length. The treated soil will retain its effectiveness for not more than two years.

This soil treatment is desirable but not essential. Termites cannot enter a building erected on a slab floor with treated joints, except by building conspicuous communication tubes over the apron. These can be easily seen and broken, *provided that the apron is kept clean.*

(*e*) The aerial portion of the building must be secured to metal or wooden structures let into the concrete slab, *and not passing through it to the soil beneath.* It is most unsatisfactory to sink wooden posts through concrete floors into the soil where they are exposed to termite attack which cannot be detected. If holes must be made in the slab, they should be treated with creosote oil. Metal barriers, discussed in the next section, may not be used with slab floors because debris soon accumulates under them and renders them useless. Concrete floors lack the warmth and resiliency of wooden floors, and they are not therefore favoured for dwellings. This disadvantage may be overcome by laying a wooden floor over a concrete slab floor. This may be carried out in several ways, details of which can be obtained from a qualified architect.

2. Application of Metal Barriers.—Metal barriers should be used over all foundations in termite infested areas.

If wooden stumps are used they should be cut from termite resistant timber such as red gum, grey box or Murray pine. Metal barriers placed over stumps are called caps. Caps should be stamped from a single piece of 24–26 gauge galvanized iron. If they are made by cutting and bending, the meeting edges must be soldered to close all gaps. The caps should extend $2\frac{1}{2}$ inches beyond the edge of the top of

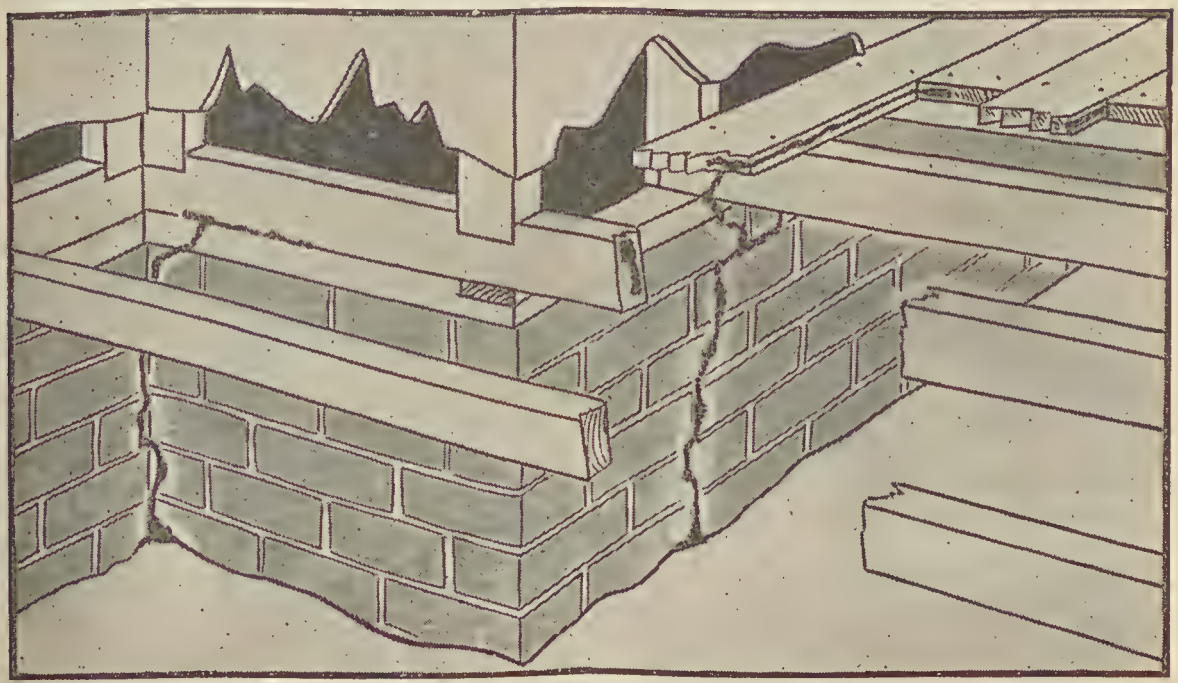


Fig. 2.—Building foundation showing earthen termite communication tubes reaching from the soil to the flooring timbers.

the stump on all sides. A lip 2 inches wide should be bent downwards all round at an angle of 45 degrees (see Fig. 5).

The cap must not be pierced by nails or spikes. These tend to crack the metal, and a single crack $\frac{1}{16}$th inch wide is sufficient to allow termites to pass through. One crack can render an entire set of caps useless. To fasten bearers to stumps, bent bolts should be used as shown in Fig. 6.

On masonry foundations the metal cap is replaced by a continuous strip of 24–26 gauge galvanized iron. It is let into the masonry to prevent termites passing behind it, and rests on the damp-proof course. It projects $2\frac{1}{2}$ inches beyond the masonry with a lip 2 inches wide inclined downwards at 45 degrees. Corner joints must be soldered. On internal walls the strip is simply an elongated termite cap. Internal walls should be separated from one another and from main walls by short gaps to avoid the necessity for complicated metal joints (see Fig. 7).

As the function of metal barriers is to isolate timber above the foundations from the soil, no unprotected connexion must be permitted between the soil and any portion of the building above the barriers. Rubbish must be removed from beneath the floor and care taken that steps, trellises, unprotected outhouses and similar structures do not provide termites with a means of entry into the building above the metal barriers. It is advisable to provide a minimum clearance of at least twelve inches between the soil and the bottom surface of bearers.

In areas where attack by termites is a very common occurrence, there should be sufficient clearance to permit an inspection of the foundations should this ever be desired.

3. Use of Repellent Chemicals.—*The use of repellent chemicals is not recommended for anything except temporary structures.* Creosote oil is one of the most effective termite repellents and is available in quantity from tar distillers. It has been quoted recently at about 1s. 9d. per gallon in 44-gallon drum lots. Small quantities may be purchased in Melbourne at about 10s. per 4-gallon tin (tin inclusive). The oil should be purchased to conform to the Australian Standard Specification K. 55 (1936) for creosote oil for wood preserving purposes. Creosote oil is relatively harmless to handle, but should not be taken internally or allowed near the eyes. If the oil is accidentally splashed into the eyes, they should be thoroughly rinsed immediately with water and saliva followed by thorough washing with castor oil. Medical attention should then be sought.

Application of Creosote.—The oil should be painted over the stumps to a height of twelve inches. If the stumps are shorter than twelve inches, the whole stump should

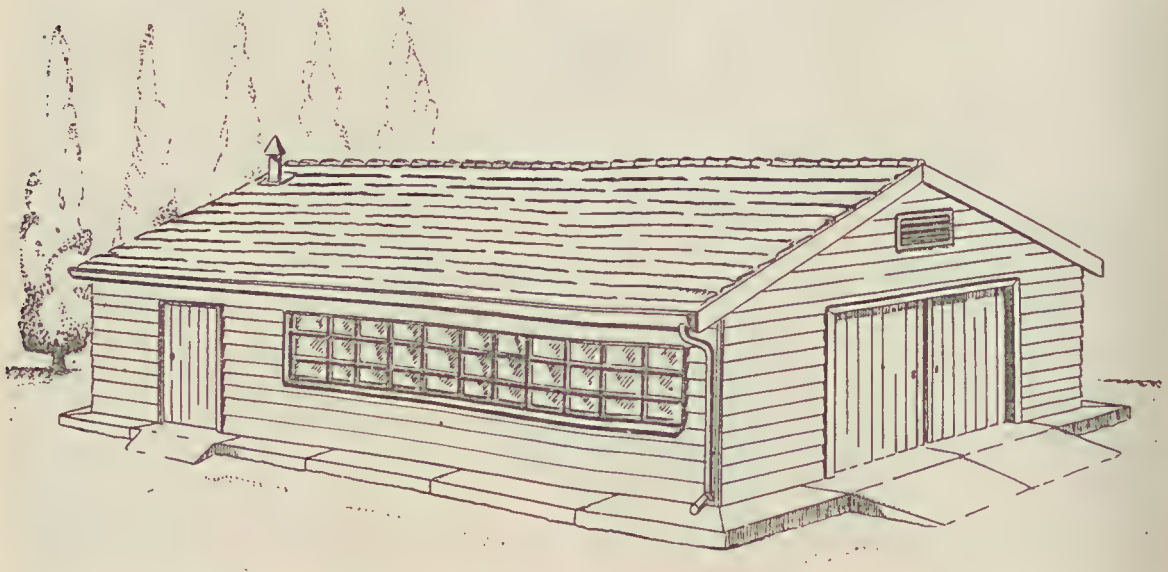


Fig. 3.—Building erected on concrete slab floor showing isolation from soil.

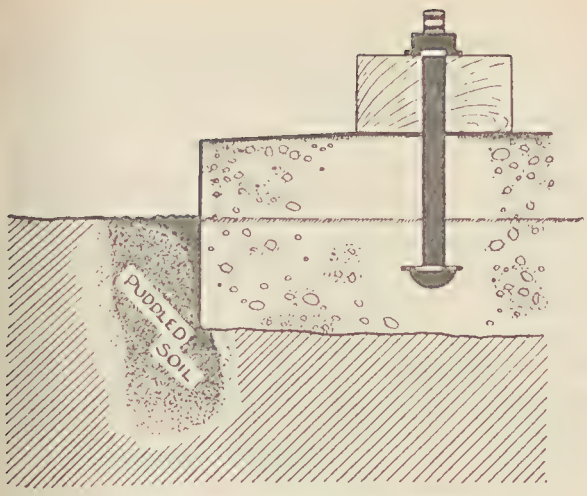


Fig. 4.—Edge of concrete slab showing one method of attaching superstructure without piercing the slab.

be painted and the bearer as well. The soil around the base of each stump should be puddled with the oil to form a layer of treated soil 2 inches wide and 6 inches deep. One gallon of oil should be sufficient to treat the soil around three 4 inch x 4 inch stumps (see Fig. 8).

The soil should remain repellent for three or four years beneath a floor. In exposed situations, it would not be safe to rely on the soil treatment for more than two years. Unprotected connexions between the soil and the timber above the creosoted zone must be avoided.

Treatment of Termite Infested Buildings

It is not difficult to control termite attack unless the circumstances are exceptional. The attack is usually spasmodic and termites may leave damaged wood for no apparent reason before they are discovered. However, it is advisable to apply control measures in the case of damage even though no termites are found.

Success in dealing with termites depends on the intelligent application of the control measures. Indiscriminate spraying of foundations with preservatives is not good practice, and, furthermore, spraying is not more effective than brushing.

The type of control measure to be adopted will depend upon the circumstances. The following cases warrant different treatment :—

(*a*) Termite Attack in an Unprotected Building.—It is almost impossible to fit metal barriers to a building after it is erected. For this reason repellent chemicals must be applied. In some cases the operation may be difficult owing to low clearance between the bearers and the ground.

Treatment.—Trace the termites back to the point of emergence and treat the soil, stumps (and bearers and floor if necessary owing to low clearance), with creosote oil as described in the section dealing with repellent chemicals. Masonry foundations can be similarly treated. It is preferable to treat and puddle all the stumps, or to puddle the soil against the full length of the masonry foundations, but this may not always be possible. Treatment at the point of termite emergence from the soil may act as a sufficiently severe check to the insects. Where it is difficult to reach the foundations, it may be cheaper to rely on the treatment at the affected area and deal with any other attack as it occurs. Termites which may remain in the aerial portion of a building after the foundations have been treated to control an attack, will die out without causing further harm.

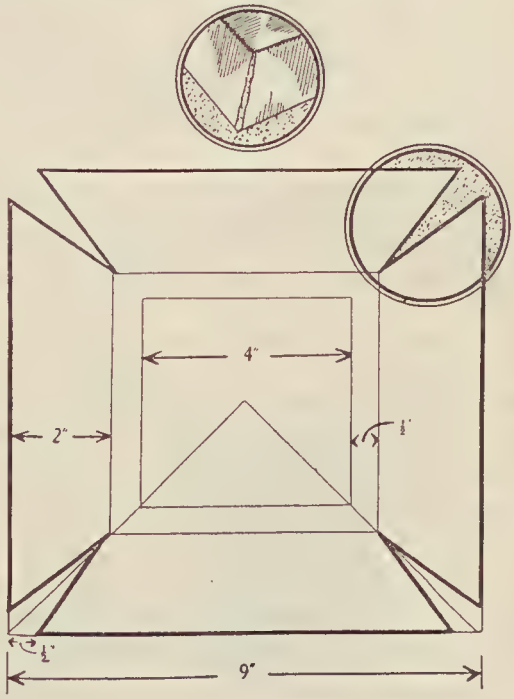


Fig. 5.—Galvanized iron termite cap for a 4" by 4" stump showing method of cutting and soldering corners.

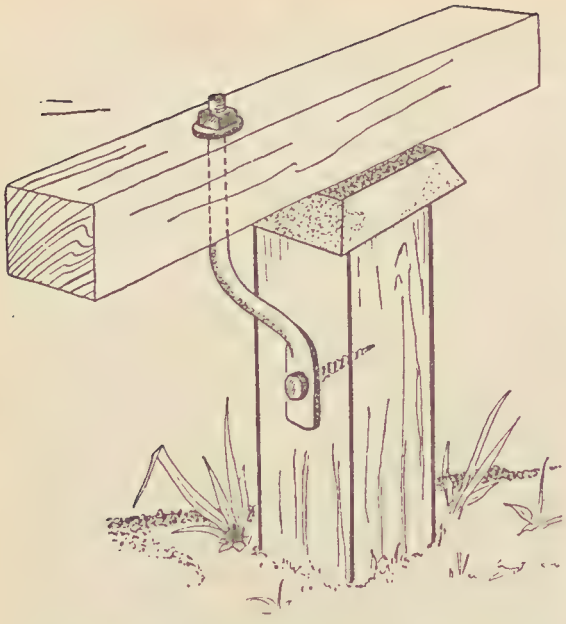


Fig. 6.—Wooden stump and bearer with termite cap and bent bolt.

(*b*) Termite Attack in a Structure Erected on Stumps Treated with Creosote.—There are two possible reasons for the attack. If the structure has been freshly treated with creosote, the attack indicates that rubbish or an unprotected structure is providing the termites with a passage around the repellent surfaces, or that some surface has not been properly treated.

If the treatment was carried out a year or two, or more, before the attack, the original repellent effect of the creosote may have decreased and retreatment may be necessary.

Treatment.—In the case of recently treated foundations, trace back the termites to the point of entry, treat any untreated surface, or remove any material providing a passage around the treated surfaces. In the case of foundations requiring retreatment, proceed as directed under the section dealing with repellent chemicals.

(*c*) Termite Attack in a Building Fitted with Metal Barriers.—Such attack indicates that the termites have discovered a break in a cap or strip, or have found a route, by means of rubbish or some unprotected structure, round the barriers.

Treatment.—Trace the termites back from the damage to the point of entry into the foundations. Repair the faulty barrier, or remove the rubbish or the unprotected structures.

(*d*) Termite Attack in a Building Erected on a Concrete Slab.—Termites cannot obtain entry except through a break in the slab, through a joint, or over the edge of the apron where it has been covered by dirt or debris.

Treatment.—If necessary, the apron should be thoroughly cleaned and creosote oil applied to the crack, or joint, or to the loosened soil against the apron at the point of entry as already described in the section on concrete slab floors.

Control of Termites by Means of Poison Dusts

The control of termites by the treatment of infested timber with toxic powders such as white arsenic is not recommended for general use. Where it is not possible to work beneath the floor of an infested building, or where for other reasons treatment of the foundations is impossible or inconvenient, poison dusts may be used as a last resort. Good results may be obtained, but the method is unreliable and does not prevent further infestation.

The details of the method are as follows :—

1. Place about $\frac{1}{8}$th oz. of arsenic in a small glass or metal tube fitted with a blower (rubber bulb or small hand pump).
2. Gently open with a sharp chisel a gallery in the timber in which termites are working until the point of the tube can be inserted. The termites must be disturbed as little as possible.
3. Blow in the dust and immediately close the hole and seal it (e.g., with brown paper and paste).

The gallery must now be left undisturbed. If the operation is successful, the termites will continue to work in the gallery and will carry the poison back to the nest. It is possible that the entire colony may be destroyed.

Unfortunately, termites are liable to desert galleries which have been disturbed and it is difficult, if not impossible, to tell whether the treatment has been successful or not.

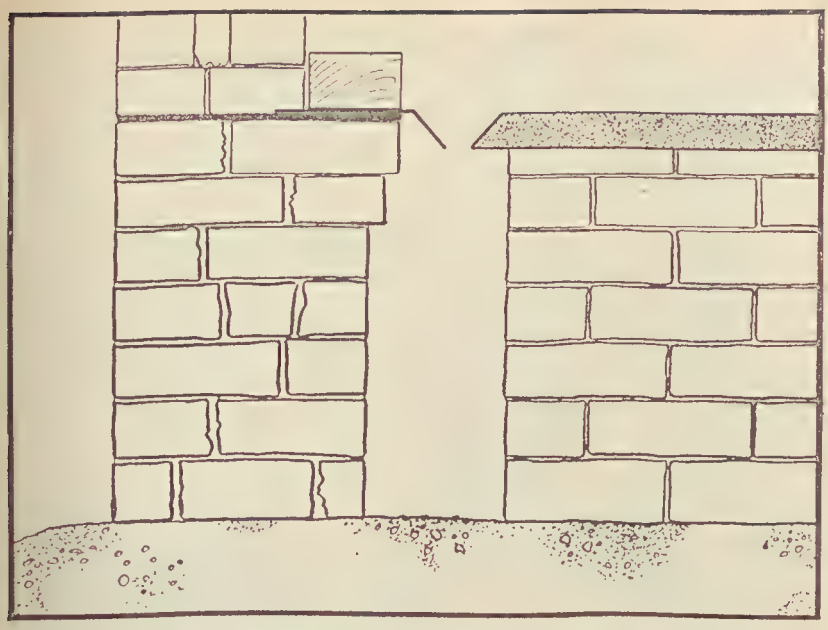


Fig. 7.—Masonry foundation showing method of fixing termite shields to main walls and dwarf walls.

The treatment provides no protection against attacks from other termite colonies which may be in the vicinity of the building. This is a serious disadvantage in areas where termites are frequently encountered.

Occurrence of Termites in Firewood and New Building Timber

Termites found in firewood or in new building timber will not attack buildings or wooden structures, if the infested timber is placed near or in them.

Theoretically, it might be possible, under most exceptional circumstances for the nucleus of a new colony to be introduced into an area in infested timber. In actual practice, the risk is negligible.

Treatment of Round Timber to Prevent Termite Attack

Round timber of low natural durability can be rendered resistant to termite attack and decay for periods of twenty years or more by correct treatment.

There is no satisfactory treatment to give permanent protection to sawn or split timber. If timber is sawn or split from durable woods, such as grey box, red gum, red box, Murray pine, red ironbark and the like, no treatment is necessary. Timbers sawn or split from less durable woods, such as messmate, stringybark, peppermints and the like are difficult to treat because of the impenetrability of the heart-wood.

Any kind of round timber, however, can be treated successfully because of the porous layer of sapwood which varies in depth from about $\frac{1}{2}$ to 1 inch.

Method of Treatment.

The details of the treatment are as follows:—

Cut, bark, and stack the timber as shown in Fig. 8. During the summer, timber should remain in the stack for at least a month. In winter three months is necessary, while, during this season, the stack should be covered to shield it from rain. After stacking for the required period the timber is ready for treatment, which is only necessary for those portions which will be exposed to termite attack. In nearly all cases this will be the butt of a post. Immerse the butts of the timbers in a drum containing creosote oil to about 12 inches above what will be the ground level when the timbers are set

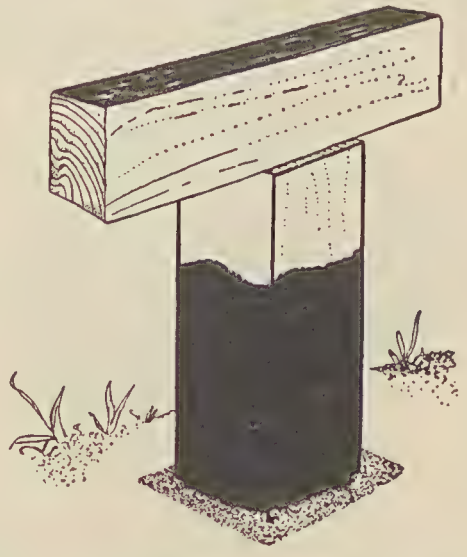


Fig. 8.—Wooden stump and bearer showing application of creosote to stump and to soil.

in the ground. Heat the oil to about the boiling point of water (212° F.) for four hours. If the temperature is raised much higher than this the oil will boil, froth over, and may catch fire. After four hours, draw the fire and allow the timbers to cool down in the oil until it is no hotter than blood heat.

Alternatively, have two drums, one hot, one cold and transfer the heated posts rapidly to the cold oil. In this case the timbers should cool down in the oil for several hours. During the cooling period the oil is absorbed by the sapwood on the timber.

Treated timbers may be stacked until required or set in place immediately. This preservative treatment makes the timber resistant to decay as well as termites. Fig. 9 shows a simple type of treatment plant.

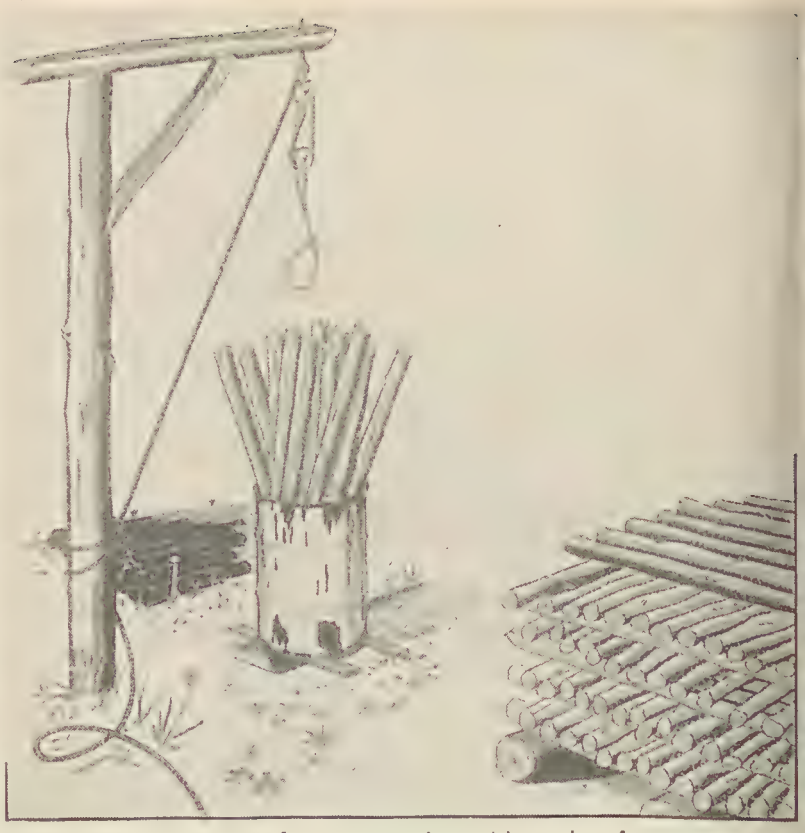


Fig. 9.—A simple type of treatment plant with stacks of untreated and treated posts.

This treatment is of direct practical interest to agriculturists. Small round timbers which are frequently burnt during clearing operations can be converted into durable material. Sapwood usually rots after about two years in the ground leaving only the heart-wood core, and small untreated posts, for example, are of little value. Treated round posts, however, conserve the sapwood and it is possible, therefore, to make use of material of small diameter. Suggested applications for this treatment are:—

Butt treatment of round uprights for sheds, barns, tank stands, yards, &c.; butt treatment of fence posts; complete treatment of building stumps.

The amount of oil absorbed will depend on the diameter of the post. A post twelve inches in diameter may absorb ¼ gallon of creosote or more, per linear foot of treated butt. A post with a four-inch diameter may absorb about ½ pint per linear foot of treated butt.

Freshly treated posts which are wet with oil may be a little more liable to catch fire than untreated posts. After treated posts have weathered for some time, there is no appreciable difference.

Timber treated with creosote cannot be painted over.

LATE BLIGHT OF POTATOES

By Officers of the Biological Branch

LATE Blight or Irish Blight of potatoes is caused by the fungus *Phytophthora infestans* and under conditions favorable for its development, is capable of causing serious damage to potato crops. In 1845–46, it caused a complete failure of the potato crops in Europe, and left famine in its wake. The disease was recorded for this State in 1909, and in the 1910–11 season caused an epidemic here, 75 per cent. of the crop being destroyed. Since then only minor outbreaks have occurred and these infrequently, because the weather conditions during the susceptible period of the growing crop, that is at the flowering stage, are normally not conducive to its development. Our experience of this disease over the past 25 years has shown that, except in isolated areas where crops may be affected with this disease more frequently, yearly spraying as a protection against Irish Blight is not an economic practice.

SYMPTOMS AND LIFE HISTORY

The disease may attack either the above-ground portions of the potato plant, or the tubers under-ground.

The first symptoms are seen on the leaves of the plant, in the form of irregular brown to black patches, varying in size, but generally located towards the edges and tips of the lower leaves. Under favorable weather conditions these dead areas spread rapidly until the entire foliage is killed. This occurs in moist, muggy weather, and it is for this reason that the disease is called " Late " blight, since such conditions generally do not prevail until after blossoming time.

Affected plants, as they decay, often emit an offensive odour. A sure sign of blight is the characteristic whitish mould which develops on both sides of moist, blighted leaves, especially if damp, muggy conditions have prevailed for a few days.

The fungus itself is internal in the leaf, and only grows out through the surface of the leaf into the air to form spores. The spores, or seeds of the fungus, are produced at the ends of the whitish mould. When ripe they become detached and are spread by wind or other means. These spores are capable of infecting any healthy potato plant on which they happen to alight. Spores may be produced in a few hours under favorable conditions, so that the spread of the disease may be rapid. It is possible for an entire crop to be destroyed in a few days.

Under dry weather conditions the spread of infection is checked. Infected leaves may drop off leaving the plant rather bare, but the whitish mould or spore-bearing structures are not produced on the infected leaves, and consequently the fungus is unable to spread rapidly.

The disease has two effects upon the crop. The death of portions of the leaves of the plant will reduce the number and size of the tubers, as the plant is unable to elaborate sufficient food material in the remaining leaves. This reduction in yield may be the only effect noticeable in lightly affected crops, particularly under dry conditions, but is nevertheless important. Usually, however, the tubers are infected

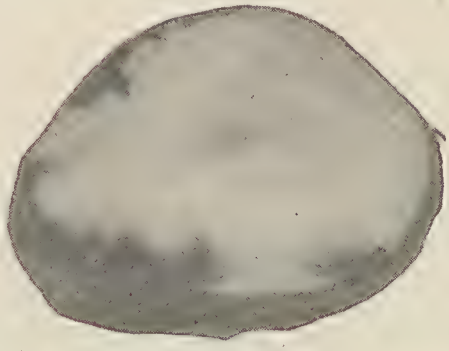


Fig. 1.—Section of tuber affected with Late Blight

directly by the fungus, to produce a dry or wet rot according to prevailing conditions. Moisture is essential as this infection takes place by spores of the fungus produced

on leaves, as described above, being washed down into the soil. At first, rusty, discolored patches are noticeable just under the surface of the tuber, and are generally not very extensive (Fig. 1). The disease, however, may spread rapidly, and the tuber may be a completly decayed evil-smelling mass before harvest, due to the activities of the blight fungus, and other secondary soil organisms.

Where conditions are less favorable, the infected areas do not penetrate very deeply into the tuber, and remain relatively dry and firm. The surface of the tuber above infected areas becomes slightly sunken and darker in colour than normal. Blighted tubers may be distinguished from those with the condition known as "fleck" by the fact that in the latter case the browning of the tissue does not reach the surface of the tuber.

Relatively little rotting of the tubers may occur in the field and yet severe losses may be sustained, due to the development of the rot under poor storage conditions.

Although it has been shown that the fungus-causing blight can live on decaying matter in the soil, there is no satisfactory evidence at present available to show that this is an important means by which the disease carries over from season to season. The main source of infection is the planting of infected tubers.

The most favorable temperature for the development of the disease is from 63° to 65° F. Where the mean temperature exceeds 77° F. the disease does not occur. Moisture is also very essential to the development of serious outbreaks of late blight. A warm period of heavy rain, followed by a drop in temperature to about 63° F. represents ideal conditions.

CONTROL MEASURES

Usually, under Victorian conditions, late blight does not cause any appreciable damage, so that growers are often reluctant to take any steps to control the disease. It should be remembered, however, that in certain seasons, when conditions have been favorable, this disease has caused losses ranging up to 75 per cent. or more of the crop, so that some precautions, particularly in regard to seed selection, should be practised.

The following methods have given satisfactory control of this disease under conditions where the disease is prevalent.

(*a*) *Selection of Seed.*—If possible, infected tubers should not be planted, as these are the main source of infection from year to year. Tubers designed for seed should be picked over after digging and any showing signs of disease removed before storage, as the presence of such tubers may lead to contamination of the remainder. Store in a cool dry place to prevent the development of tuber rot in any diseased tubers which may have been overlooked. Many growers claim to have produced satisfactory crops by the use of infected seed, but it must be pointed out that the conditions under which those crops were grown were not favorable to the development of the disease.

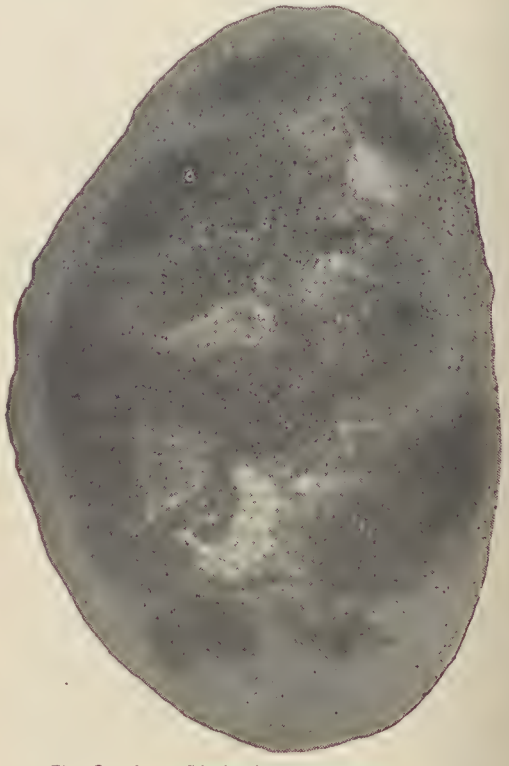


Fig. 2.—Late Blight lesions on the tuber

(*b*) *Spraying.*—In countries where this disease frequently develops, spraying has been found to be satisfactory in protecting plants from infection and reducing the spread of the disease. The resultant increase in yields obtained has more than offset the cost of the treatment. Because of the infrequent occurrence of the disease here, spraying is not recommended, except

in occasional areas particularly subject to the disease. Growers who wish to spray, may use copper soda, made up as follows :—

Eight pounds of bluestone (snow crystals) is dissolved in 20 gallons of water. Ten pounds of washing soda should be dissolved in a further 20 gallons of water. The two solutions are then poured together, and are ready for use. This spray should be applied when the potato tops are about six inches high and again at flowering time.

Where blight is present in a crop, digging should be delayed in order to permit the rot to be sufficiently far advanced in any of the infected tubers so that they can be readily distinguished at bagging time. In this way, subsequent trouble in storage from blight is greatly reduced.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-final or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If, at a re-test, any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.
Abrahams, L. J. ..	Red Hill South
Baker, J. J.	Bannockburn
Beechy, K.	Pomborneit
Betts, V. R.	Craig's Lane, Pomborneit
Bidgood Bros.	Wodonga
Bodey, A. A.	"Bonnyview," Dooen
Bright, George H. ..	Dumbalk
Buller, R. A.	Beaconsfield
Castle, L. H.	Clarinda
Chapple, S. T.	Rye
Coates, R. J. H. ..	Corangamite
Cox, H. H.	Jacaranda Stud, Leopold
Critten, H. S.	Dumbalk
Devine, Herbert ..	Swan Marsh
Dingwall, A. E. ..	Maffra
Dookie Agricultural College	Dookie
Doornbusch, John L. ..	"Starpark," Nhill
Dowie, Alexander ..	Mt. Moriac
Ellwood, A. H. ..	Paschendaele
Fairchild and Clutterbuck	Tinamba
Goding Bros.	Mooroodue
Hamblin, A. T., and Sons	Toolleen
Hardinge, B., and Sons ..	Nar Nar Goon
Harris, Clement C. ..	"Egerton Villa," Loch
Harrison, C. T. ..	"Eastside" Stud, Pomborneit
Hawton, I. E. and F. ..	"Rossmoyne," Colac
Haywood, Dr. A. R. ..	Hastings
Horn, L. A.	Leongatha North
Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Longerenong College ..	Dooen
Mackenzie, A. S. ..	Upper Beaconsfield
Marriott, F. C.	Bentleigh East
Mundy Bros.	Orbost
Noble, T. M., and Sons ..	Maffra
Northcote Children's Farm	Bacchus Marsh
Petersen, E. V. ..	Korumburra
Richards, Albert H. ..	Dumbalk, via Meeniyan
Rintoul, J. T. C. ..	Glengarry
Roy, W. A.	Morrell's Hill, via Boolarra
Sexton, John	Swan Marsh
Simpson, Ronald D. ..	Birregurra
State Experiment Farm ..	Rutherglen
Trenery and Sutherland	"Promview," Foster
Trigg, A. J.	Bungaree
Trigg, N. H.	Bullarook
Tweddle, J. T.	"Winlaton," Shepparton
Warry, A., and Sons ..	Delburn
Whelpton, B.	Whittlesea North
White, G. W.	Boolarra South

IN THE ORCHARD

By G. W. GAYFORD, B.Agr.Sc., *Horticultural Instructor*

Winter Pest Control

THE winter season provides a good opportunity to seek out and destroy many of the pests which inhabit orchards, thus reducing the numbers which will cause damage in the growing season. The orchardist is in constant battle with pests and diseases and there is no likelihood of any "peace declaration" being made. It is necessary, therefore, to take advantage of loopholes which appear in the defences of this army. The orchardist, during the winter, can bring up his heavy artillery in the form of sprays which can be applied in a more concentrated and therefore more effective form when the trees are dormant.

Scale insects which occasionally appear on deciduous trees include San Jose, apple mussel, citrus red scale, olive scale, soft brown, and vine scale. Scale insects are small, rounded or elongated bodies which become firmly attached to the limbs and twigs of fruit trees. San Jose scale is one of the most destructive, causing loss of vigour and sometimes the death of limbs. The scale is small and circular, with a dot in the centre. When fruit is infested, a red colouration appears on the skin of the fruit surrounding the scale. San Jose scale may be controlled on severely infested trees by a spray consisting of 2 gallons of winter white oil, 5½ gallons of lime sulphur and 72½ gallons of water. For light infestations of San Jose and other scales, red oil at a strength of 1 in 20 or lime sulphur 1 in 9 may be applied.

Pear leaf blister mite causes small green blisters on the leaves of pear trees which later turn dark brown in colour. The mite which causes the trouble cannot be seen with the naked eye. It overwinters under the bud scales and may be controlled by thoroughly spraying the tree with lime sulphur, 1 in 10, during the winter.

Vine erinose is also caused by a small mite which, in the growing season, causes raised areas on the surface of grape-vine leaves. The undersurface of these areas is covered with a dense hairy growth. The erinose mite, which overwinters under the bud scales of vines, may be controlled by spraying with lime sulphur at a strength of 1 in 10 during the dormant period of the vines.

Bryobia mite.—The eggs of the bryobia mite can be seen as red-coloured clusters at the base of spurs and twigs on apple, pear, and plum trees. In the summer severe infestations of these mites cause a serious lack of vigour in fruit trees. Leaves of trees become yellowish and unhealthy due to the mites sucking the sap. Winter sprays of red oil, 1 in 15, or lime sulphur, 1 in 10, should be applied as a regular protection against these mites.

Aphis.—Unless properly controlled, the green peach aphis can be one of the most destructive insects attacking peach trees. This insect overwinters in the form of eggs which are laid on buds of peach and nectarine trees during the autumn. Egg-laying usually ceases after the middle of June and hatching proceeds during early spring, the insects quickly attacking the young leaves where they multiply rapidly. In severe infestations, growth may be severely affected due to defoliation of new shoots. Fortunately, the period from the middle of June to the middle of July gives an opportuntity to attack the egg stage of this insect which is then in maximum numbers on the trees. The most effective sprays for this purpose are either tar distillate, 1 in 35, or sprays containing D.N.C. which are specially prepared for this purpose. Red oil cannot be recommended for control of green peach aphis. The aphis normally spends part of the late summer on weeds in and around orchards, from whence it migrates to the trees for egg-laying. Because of the lush growth of weeds in orchards last summer, heavy egg-laying can be anticipated and peach growers are urged to apply winter

Dinitro-cresol

sprays. Nicotine sulphate for spring spraying is in short supply, but in any case, this method of control is not efficient.

Winter sprays of tar distillate, 1 in 50, are also required for the black cherry aphis, but are ineffective against the black peach aphis which damages peach, nectarine, and plum trees. This insect lives on the roots of these trees and during the late winter ascends the trunks of the trees and quickly multiplies when the new growth commences in the spring. For control, a barrier in the form of one of the sticky tanglefoot substances smeared on a piece of brown paper and attached to the trunk would prove effective. A mixture for this purpose may be made by mixing 4 parts of castor oil with 9 parts of resin and heating without boiling. Otherwise a careful watch should be kept for the ascent of these insects and sprays of nicotine sulphate, 1 pint in 80 gallons of water plus either 2 lb. soft soap or 1 gallon white oil emulsion should be applied as soon as the aphis appears on the upper parts of the tree.

Woolly aphis. — The parasite, *Aphelinus mali*, is a wasp which normally does a thorough job in controlling woolly aphis on apple trees. In some seasons, particularly when the autumn is cool and wet, the aphis population builds up because of reduced activity by the parasite. It then becomes necessary to apply a spray of red oil, 1 in 20, during the winter. A high pressure is required in order to penetrate the aphis clusters.

Codling moth is one of the pests which may be attacked during the winter. The overwintering grubs secrete themselves in cracks in the trunk and branches of apple and pear trees, under pieces of loose bark, in packing cases, and in sheds. Every two or three years some time should be spent during the winter in thoroughly scraping loose bark from the butts and lower branches of trees and filling in cracks with putty or cement.

Many fruitgrowers who have otherwise clean orchards, find difficulty in controlling codling moth in the vicinity of packing sheds. Now that flywire is becoming more plentiful, doors and windows of sheds should be wired-in to prevent the escape of moths during the spring. If possible, cases should be stacked inside the shed during this period because they are a constant source of re-infestation.

By careful attention to the above points, fruitgrowers will be able to fall into line with the orchardist who recently erected this sign outside his property, "You can eat our apples at night!"

SHEEP NASAL BOT

Infection with sheep nasal bot causes a rather thick nasal discharge with sneezing and other signs of irritation. The bot is situated in the air spaces of the head and the irritation is aggravated by two small hooks by which the bot is attached.

The bot is the intermediate stage of the sheep bot fly which is difficult to see as it is an extremely fast flyer. It attacks the sheep during the summer and early autumn and deposits the small bots about the nostrils of the sheep. The presence of the fly is indicated by the sheep burrowing their nose into the ground, or moving about to prevent the fly depositing the small bots.

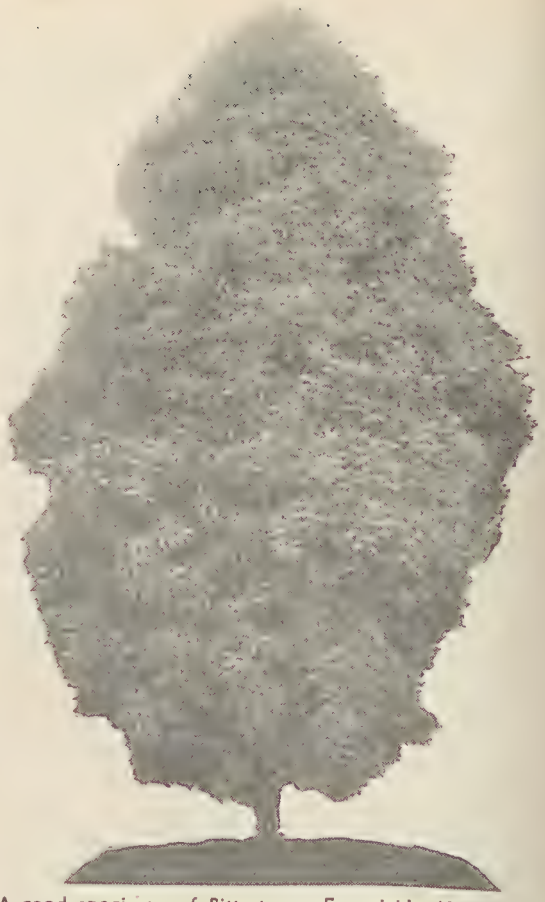
The fly uses the sheep as a means of surviving the cold weather, and in the form of a bot the fly spends the winter in the air spaces of the sheep's head and does not become an adult fly until the spring. It is possible in cold countries, such as Canada, to irrigate the head spaces during the winter with an emulsion and destroy the nasal bot, but this is not practicable under Australian conditions, as the fly could still survive away from the sheep.

Methods of control are the provision of shade trees and also small furrows of ploughed earth may assist in the prevention of the attack of the fly. Tar preparations applied on the nostrils may prevent the fly from depositing the bots. This may be applied by hand, or from bagging about feeding troughs placed in such a way that the sheep will smear some of the preparation on its nose when about to eat.

[Contributed by the Live Stock Division.]

THE FLOWER GARDEN

By T. H. KNEEN, B.Agr.Sc.,
Acting Principal, School of Horticulture, Burnley



A good specimen of *Pittosporum Eugenioides Variegatum*

Variegated Shrubs

Variegated varieties of many of the commoner garden shrubs make useful specimens in most gardens. Most of them are very hardy and are usually seen to best advantage when grown in full sunlight. They are useful for the bright effect they give to otherwise gloomy corners by relieving the normal green colours in the shrubbery, and can be established in situations where the choice of flower shrubs would be limited. They are grown principally for foliage effects, but in any case do not usually flower as freely as their green relatives, if indeed they flower at all. As a class they are less vigorous than the normal green varieties.

In plants which are truly variegated the coloured areas are quite clearly defined, a point which distinguishes them from plants suffering from various chlorotic conditions, due, for example, to the lack of iron. In the latter case the proper treatment will bring about a normal development of green colour. Mottle leaf in citrus is not a true variegation, it being due to a zinc deficiency, and is corrected by the use of sprays containing zinc. There is, however, a true variegation to be seen occasionally in lemon trees, and this causes both fruit and foliage to show striped markings of unusual beauty.

The variegated condition can be transmitted by budding and grafting, a fact which suggests to many that the condition is due to a virus disease. However, the causes of variegation are not fully understood. Various extreme environmental conditions appear to promote variegation, and it is a matter of common observation that a variegated branch may appear on an otherwise normal plant, due to the phenomenon of bud-variation.

Variegations of this type can be reproduced usually only by budding, grafting and cuttings. Such plants rarely produce viable seed and if they do the seed seldom produces variegated plants.

A wide range of variegated shrubs is available and to mention them all would make a formidable list. Some of the more useful are listed hereunder :—

Buxus sempervirens var. *variegatum* is a slow-growing plant of great longevity, excellent for tub specimens and will stand clipping.

Cotoneaster horizontalis var. *variegatum* is useful for rock gardens but does not form berries in the same profusion as the green variety.

Euonymus japonicus var. *aureo-Marginatus* is characterized by the golden margin of its leaves.

Nerium Oleander—The variegated form does well in hot, dry conditions and for this reason has special uses.

Pittosporum eugenioides variegatum is a large shrub of fairly rapid growth, making a useful background for other specimens.

Symphoricarpos racemosus var. *variegatum* is a small shrub with light graceful foliage, worthy of a place in any garden.

Weigela rosea var. *variegatum* is one of the best of the medium-sized shrubs, bearing attractive pink flowers in spring. It is deciduous.

THE VEGETABLE GARDEN

JUNE SOWINGS		
Lettuce	...	New York, Imperial 615
Peas	...	William Massey (Melb. market)
Onions	...	Australian Brown, White Imperial
Cabbage	...	Parisian

Rhubarb

Rhubarb is a crop which is usually handled with indifference by the average home gardener. He simply relegates it to some out of the way corner, where the plants are not as productive as they might be. Properly handled a few plants can be made to produce an ample supply all the year round, particularly if winter-growing varieties, such as Topp's Winter, are included. The only difference in handling the latter is that division of the crown must be done either in autumn or spring, before or after the main growth period. Otherwise, the normal summer-producing varieties may be divided now.

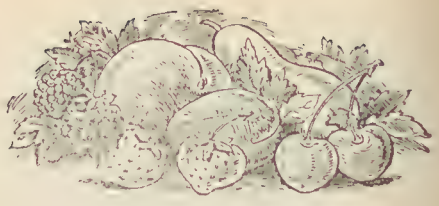
If room is available, establish a row of half a dozen crowns along one edge of the vegetable garden, allowing 2 ft. 6 in. between plants, and a bed not less than 3 ft. wide to allow full development of the crown. While in full sunlight the buds should not be unduly exposed to hot winds.

The crop is perennial and will be divided after about five years. For this reason it will pay to dig the soil deeply and manure liberally with any thoroughly decayed manure at a depth of 9 to 12 inches. In addition, a dressing of 4 oz. per square yard of market-garden manure may be worked into the completed bed.

Old crowns should be divided with a sharp knife so that there is a good sound piece of root attached to each eye or bud. The crown should then be set so that the bud is just clear of the ground level.

Summer varieties will have made considerable growth by the end of November, but for best results the plants should be picked over sparingly during the first season.

MELONS *and* QUINCES



By RUTH BROMFIELD, *Fruit Preserving Expert*

Now that the main fruit season is over, melons and quinces are being welcomed by housewives who have not yet completed their jam-making and fruit preserving for the year. These fruits may be used in a variety of ways, and possess an added advantage in that they are not expensive. Some recipes for utilizing both melons and quinces are given hereunder.

Bottled Quinces

A MUCH more attractive and better flavoured preserve will result if the prepared fruit is simmered very slowly in the syrup until the flesh has turned pink.

The fruit should first be peeled and cut into sections and the cores removed. Make the syrup in a preserving pan, using 2 cups of sugar to 2 cups of water and when boiling, add the prepared fruit. Simmer gently for an hour or more and then pack into hot bottles, cover with syrup, partially seal or seal according to the type of jar and process at boiling point for 20 minutes.

The best way to heat the preserving jars is to put them on the platform in the sterilizer, pour in water to come just below the surface of the platform (i.e., about 3″ deep) and when the water comes to the boil, steam the jars at least 10 minutes, before carefully lifting the hot fruit into the drained jars. The filled jars are then returned to the sterilizer, water is added so that it still comes just below the platform level. Cover the top of the sterilizer, and after the water boils, allow 20 minutes. Remove the jars and complete the seal.

Quince Jelly

It is impossible to make a well-set jelly if ripe fruit is used. The quinces should be barely tinged with yellow and freshly picked. Even under such conditions, it is wise to add the juice of 2 or 3 lemons to each four pounds of quinces.

It is not advisable to make up jelly with more than 6 lb. of fruit at a time.

Wash the fruit thoroughly to remove the fuzz. Cut into quarters or smaller, discarding the seeds and stalks—the core may be left intact. Put the fruit in a pan with the juice of the lemons and barely cover with water. Simmer very slowly, with the lid on the pan, for about 2 hours. Strain through muslin, then flannel and measure. Add 1 cup of sugar to each cup of juice. Dissolve the sugar and boil rapidly until it will flake off a spoon dipped into the boiling mixture (about ¾ hour).

Whole Quince Jelly and Butter

This method produces a deep red jelly more attractive than that obtained by using the previous method, but the resulting jelly is not so certain to set. If, however, underripe fruit is used the result is usually good.

4 large underripe quinces.
4 pints water.
2½ lb. sugar.

Simmer all together till the liquid will flake off a spoon as above. The lid should be left on the pan for the first hour, then removed for the rest of the cooking period. It usually takes 3½ to 4 hours to reach the setting stage. Boil rapidly for the last half hour of cooking, when the liquid is deep red in colour. Strain through four thicknesses of muslin into hot bottles. Seal.

Quince Butter

The cooked quinces from the above may then be put through a sieve and simmered for a few minutes until no liquid separates from the pulp. It should then be put into hot sterilized bottles

(boiled for 10 minutes) and sealed immediately. This butter is not so sweet as jam and, therefore, has a fresher fruit flavour.

Quince Honey

The preparation of this jam is less tedious than the usual recipe and the resulting flavour is equally good.

5 lb. quinces.
5 lb. sugar.
1 qt. water.

Boil peels and cores in water till cooked, then strain and add the grated quinces to this liquid. Simmer 10 minutes, then add the sugar, dissolve and boil till of a good consistency and colour.

Marmalade Melange

This recipe makes use of fruit available now and is very useful for a pastry or cake filling. Wash, peel, and core 2 large sour apples and 2 large quinces; dice. Dice 1 lb. unpeeled red-stalked rhubarb. Combine fruit with 1 cup seedless raisins, add 3 cups sugar, 3 tablespoons lemon juice, and 1 tablespoon grated lemon rind. Let stand ½ hour. Bring to boil; cook slowly 30 minutes or until thick, stirring often. Cool 5 minutes. Fill into hot clean jars. Seal at once.

Melon Jam

Peel, seed and cut into blocks, weigh and put in a bowl. Allow ¾ lb. sugar to pound prepared melon, sprinkle with half this (mixing throughout) and allow to stand overnight. Next day add ½ pint water to each pound melon and any desired flavouring and simmer till the melon is quite soft. This will take about two hours. Then add the balance of the sugar and when dissolved, boil rapidly till a good colour and consistency are obtained.

Variations.—To each 6 lb. prepared melon allow:—

Melon and Lemon—6 lemons sliced thinly and added with the water at beginning of cooking period.

Melon and Ginger—6 oz. green ginger, 3 to 4 small bird's-eye chillies.

Scrape the green ginger and cut it finely. Tie chillies in a small bag. Add with water at beginning of cooking period.

Melon and Pineapple—1 medium pineapple cut into blocks or grate and add at beginning of cooking period.

Melon and Orange—3 oranges, slice thinly and add at beginning of cooking period.

Melon and Passionfruit Jam—6 lb. melon, 2 doz. passionfruit, 6 lb. sugar, juice of 3 lemons. Add juice of lemons and passionfruit pulp at the beginning of cooking period.

Melon and Grapefruit Jam—6 lb. melon, ½ lb. grapefruit, 1 pint water, 6 lb. sugar. Slice grapefruit thinly. Add at beginning of cooking period.

Melon Jelly—Peel the melon and cut up roughly. Allow ½ pint water and the juice of 1 lemon to each pound of melon. Simmer very slowly till quite tender. Strain through muslin, then through wet flannel, measure, and add an equal measure of sugar. Stir till the sugar is dissolved, then boil rapidly till it flakes in a sheet off a spoon dipped in the mixture.

N.B.—To make melon jelly, the melon must be freshly picked. Before the sugar is added and the fruit is simmering in the water, the lid should be on the pan, but it is boiled rapidly without the lid after the addition of the sugar. It should not be skimmed until it has responded to the setting test and then it should be poured into hot clean jars and sealed immediately with paraffin or cellophane covers.

TUBERCLE-FREE HERDS

Accredited Tubercle-free Herds.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86	Maloney, P. J.	Tongala	66
Armstrong and Son	Wangaratta	105	Middleton, J. A.	Longwarry North	70
Ballarat Orphanage	Ballarat	116	Murray, M. G.	Lima	26
Banyule Stud Pty. Ltd.	Wangaratta	55	McIntosh, J.	Merrigun	35
Beggs, A. R.	Beaufort	112	McNabb, G. A., and Son	Irrewillipe East	159
Black, I. S., Estate	Mount Noorat	59	Nancarrow Bros.	Kerang	48
Carne, W. J.	Pakenham Upper	27	Noonan, G.	Benalla	35
Clark, W. J.	Monomeith	148	Noonan, Mrs. S. A.	Benalla	51
Cowan, G. L. S.	Bacchus Marsh	59	Northcote Children's Farm	Bacchus Marsh	48
Cribbes, T.	Wangaratta	39	Onley, W. H.	"Glenholme," Caldermeade	58
Deering, J. T.	South Wangaratta	86	Parker, Mrs. L. M.	Tallarook	67
Dennis, Mrs. A. A.	Frankston	23	Payne, A. E. T.	"Yarra View," Lilydale	71
Dookie Agricultural College	Dookie	92	Payne, T. E. N.	"Woodburn," Kilmore	44
Everist, F. R.	Tyabb	20	Poole, M. A., and D.	Caldermeade	125
Foletta, G. G., and Son	Buxton	120	Poole, M. A., and D.	Yannathan	104
Geelong Grammar School	Corio	78	Potter, W. J.	Longwarry North	130
Gleeson, P. J., and Son	Tynong	261	Powell, T. S.	"Carellen," Mansfield	43
Gorman, A. W.	"Cathcart," Alexandra	57	Reid, Mrs. B., Estate of	Bundoora	74
Griffin, G. W.	Gladysdale	50	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Griffiths, J. G.	Benalla	151	Roe, Thomas H. P.	Cobram	27
Gross, Mrs. G. F.	Green Lake	21	School of Horticulture	Burnley	6
Hamilton, A.	Flinders	67	State Experiment Farm	Rutherglen	47
Henry, J. A.	Warrnambool	45	State Research Farm	Werribee	245
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	70	Stephens, Dr. F.	Vermont	32
Jakobi, L. W.	"Granada," Yannathan	89	St. Joseph's Home	Sebastopol	53
Johnson, F. G.	Horsham	21	Vagg, T. R.	Officedale	40
Judd, Mrs D. R.	Broughton	16	Vagg, E. J.	Leongatha	48
Lawrence, P. H.	"Rainga," Tarrawarra	83	Warnock, J. A.	Benalla	76
Light, D. T.	Noradjuha	8	Waterhouse and Son	Pakenham	55
Longerenong Agricultural College	Dooen	42	Wells, W. G.	Caldermeade	67

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.	District.	Herds.	Cattle.
Ballarat	116	2,597	Rutherglen	19	279
Benalla	97	540	Traralgon	3	174
Bendigo	63	1,564	Wangaratta	105	519
Broadmeadows	70	3,092	Warrnambool	7	219
Doncaster	19	485	Whittlesea	130	6,070
Geelong	138	4,589	Yallourn	4	370
Heidelberg	27	867	Yarragon	41	1,858
Horsham	7	382	Yea	50	147

There are also 303 herds in which 10,532 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

LICENSED SKIN BUYERS

Sheep Owners' Protection Act

The following is a list of persons licensed under the Sheep Owners' Protection Act, to buy raw sheep skins. The licences have effect until the 31st December, 1946.

Licence No.	Holder of Licence.	Address.
2181	Allan, J. R. ..	19 King-st., Melbourne
2172	Allwood, W. H. ..	High-st., Rutherglen
2120	Angliss, W. and Co. (Aust.) Pty. Ltd.	Imperial Freezing Works, Footscray
2242	Austin and Ford Pty. Ltd.	Hopetoun
2199	Australian Central Woolgrowers and Realisation	590 Little Bourke-st., Melbourne
2271	Banks, C. L. ..	48 Barkly-st., Ararat
2270	Banks, R. P. ..	Dunolly
2144	Barrett, H. L. ..	12 Bond-st., Sale
2152	Bennett, S. C. ..	71 Isabella-st., Geelong West
2188	Berman, D. ..	294 Little Collins-st., (York House, Room 11)
2178	Biggs, H. A. and Son	Korumburra
2209	Birchall, T. ..	Sandringham
2261	Borthwick, Thos. and Sons (A/asia.) Ltd.	84 William-st., Melbourne
2228	Bourke, D... ..	89 Cox-st., Hamilton
2253	Brabender, L. C. ..	Carlsbrook-rd., Maryborough
2173	Brooks, E. J. ..	Guthrie-st., Quambatook
2249	Browne, C... ..	Stanhope-rd., Rushworth
2190	Bryant, A. J. W. ..	Hanson-st., Corryong
2129	Bunn, W. G. ..	Warragul (South-rd.)
2185	Burns and McCleave	206 Mair-st., Ballarat Gong Gong-rd., Ballarat
2256	Burrows, A. ..	Scoresby-st., Kerang
2257	Burrows, G. A. ..	Scoresby-st., Kerang
2254	Burton, C. R. H. ..	Binney-st., Euroa
2140	Butler, E. and Sons..	Tallangatta
2238	Byerley, H. M. ..	Marden-rd., Payneham, S.A.
2222	Calder and Reiter ..	Korumburra (Commercial-st.)
2136	Callan, P. J. and Sons	6–8 Moorabool-st., Geelong
2130	Carlile, T. H. ..	Watson-ter., Mt. Gambier
2176	Cary, W. A. ..	Heathcote (High-st.)
2191	Cass, R.	Chetwynd
2113	Canfield, E. F. ..	Gillies-st., Rochester
2197	Claffy, A. S. ..	King-st., Rainbow
2139	Cole, M.	Camperdown-rd., Terang
2134	Cook, T. J. ..	Black-st., Terang
2186	Cook, W. J. ..	Allansford
2261	Cooper, Arthur S. Pty. Ltd.	87 Lambeth-st., Kensington
2121	Coulstock, K. ..	65 Welsford-st., Shepparton
2150	Coulstock, T. R. ..	Allan-st., Kyabram
2239	Crosthwaite, I. S. ..	Rosebery
2274	Dalton, F. and J. ..	Heywood
2175	Dewez, T. and Co. ..	Wool Exchange, 120 King-st., Melbourne
2158	Dimboola Stores Ltd.	Lochiel-st., Dimboola
2204	Downes, A. J. ..	Ritchie-st., Dunkeld
2236	Duggan, T. A. ..	Kyneton (168 Mollison-st.)
2220	Eales, F.	Bell-st., Penshurst
2112	Easton, Miscamble and Co.	Railway Yards, Williamstown
2251	Egan, B. F. ..	Portland
2224	Egan, F. H. ..	Avoca
2127	Einsiedel, E. ..	Port Fairy-rd., Warrnambool
2163	Elias, A. P. ..	Tallangatta ..
2273	Ellis, J. M. ..	39 Robert-st., Essendon
2161	Erwin, V. P. ..	Lake-st., Natimuk
2184	Evans, C. J. ..	83 French-st., Hamilton
2227	Evans, W. J. ..	Boort
2177	Ferguson, F. S. McN.	76 McIvor-rd., Bendigo Market Square, Bendigo
2123	Flanigan, J. ..	Murray-st., Colac
2248	Freeman Bros. ..	Warracknabeal
2159	Freeman, W. G. ..	Elmore
2252	Gadd, M. C. ..	Walwa
2198	Gelbart, M. ..	North Carlton

Licence No.	Holder of Licence.	Business Address.
2206	Gilfuis, W. P. ..	Main-st., Rutherglen
2192	Glover, W. H. ..	Carlsbrook
2258	Gorton, C. H. ..	Vickery-st., Alexandra
2142	Gordon, C. G. ..	645 Spencer-st., Melbourne
2272	Gordon, K. C. ..	Yarram
2216	Green, T. W. and Co. Pty. Ltd.	Bombala, N.S.W.
2203	Hardy, F. A. ..	Myamyn
2148	Hargreaves Bros. Pty. Ltd.	Ararat
2151	Hargreaves, J. R. ..	Terang-rd., Mortlake
2196	Harris, L.	Lower Main-st., Stawell
2189	Hateley, R. N. ..	Manangatang
2117	Haughton, W. and Co. Pty. Ltd.	545 Little Collins-st., Melbourne
2179	Heddle, R. L. D. M.	4 Wellington-st., Kerang
2114	Hicks, J. T. ..	Goroke
2154	Hill, D.	6 Phillip-st., Warracknabeal
2149	Holdsworth, W. ..	Havelock-st., Beaufort
2162	Hould, R. J. ..	Bryne-st., Stawell
2266	Jackson, J. Pty. Ltd.	2 Main-st., Bairnsdale
2168	James, D. T. C. ..	199 Boundary-rd., North Melbourne
2229	Jobe, C. E. ..	Stawell
2233	Johnson, A. P. ..	Station-st., Lake Boga
2279	Jones, A.	Bombala-st., Delegate
2221	Jones, E. V. ..	Harrow
2119	Kennon, J. and Sons Pty. Ltd.	River-st., Richmond
2213	Kewin, R. F. ..	Wheeler-st., Corryong
2183	Kilroy and Story ..	High-st., Heathcote
2263	Lindsay, D. H. ..	Charles-st., Jeparit
2187	Lockwood and Sons Pty. Ltd.	Birchip
2230	Long, C. J. ..	12 Campbell-st., East Kew
2244	Love, J. D. ..	211 Main-st., Bairnsdale
2200	McAree, M. G. ..	Cr. High and Warren-st., Echuca
2232	McClintock, A. E. ..	Digby
2260	McColl, D. ..	Tatura
2210	McDonald, I. A. ..	Jardiene-st., Corryong
2234	McGauchie, A. A. J.	Main-st., Cobram
2219	McLean, A. and Son	Smythe-st., Benalla
2155	McLennan, D. ..	Webster-st., Wycheproof
2211	McLennan, D. J. and Sons	Sea Lake
2278	McMillan, R. H. ..	41 Gibney-st., Maffra
2146	Marshall, G. J. ..	Edenhope
2247	Moore, D. R. ..	Hamilton-st., Kilmore
2265	Moynehan, J. P. ..	De Boos-st., Euroa
2133	Murrell, H. ..	Murray-st., Casterton
2118	Munday's Distributing Co.	46–8 Moorabool-st., Geelong
2169	Murrells and McNicol	St. Arnaud
2147	Nicklen, T. E. ..	Talbot-rd., Maryborough
2195	Nildrie, L. G. ..	27 Lonsdale-st., Hamilton
2157	North Western Wool and Skin Stores	Gummow-st., Swan Hill
2214	Nulty, B. A. ..	Dartmoor
2276	Nuske, O. A. ..	Sea Lake
2124	O'Beirne, J. and F...	Linton
2122	O'Beirne, J. D. ..	Hamilton-st., Horsham
2171	O'Brien, A. G. M. ..	Employed by Jason Wool Scouring Co., Dynon-rd., Footscray
2208	Oppenheim, W. ..	21 Peel-st., North, Ballarat
2156	Parker, S. K. ..	Wodonga
2255	Perkins, C. Pty. Ltd.	Cr. Bay-rd. and Sturt-st., Mt. Gambier, S.A.
2218	Penney, H. ..	422 Ascot-st. and Balaclava-st., Ballarat
2132	Perkins, C. T. ..	Naracoorte

Licence No.	Holder of Licence.	Business Address.
2138	Permezel, Y. A. ..	High-st., Yackandandah
2160	Perry, A. J. ..	Princes Highway, Colac West
2153	Pettit, W. B. ..	57 McMahon-st., St. Arnaud
2250	Phillips, T. J. ..	Mologa
2131	Pickthall, J. W. ..	4 Silvermines-rd., St. Arnaud
2226	Pyramid Co-op. Society Ltd.	Pyramid Hill
2259	Reason, C. T. ..	Pekin-rd., Maryborough
2115	Rehfisch, H. K. ..	223 Mair-st., Ballarat
2268	Rice, F.	Macarthur
2210	Rice, J. W. ..	20 Doveton-st., Ballarat
2217	Rice, W. T. ..	Bombala
2165	Rich and Gross ..	Brougham-place, Geelong
2164	Richards, E. R. ..	1 North-western-rd., St. Arnaud
2215	Robbins, T. ..	Cohuna
2137	Ross and Brewster Pty. Ltd.	1 Little Curran-st., North Melbourne
2128	Russell, R. ..	Colac West
2277	Salter, C. E. ..	40 McKillop-st., Geelong
2207	Sharrock, C. H. J. ..	Bessiebelle
2193	Short, I. W. ..	George-st., Hamilton
2116	Sims Cooper (Freezing Works) Pty. Ltd.	31 Queen-st., Melbourne
2174	Stanton, J. ..	Nelson-st., Nhill
2245	Stevens Bros. ..	160 Firebrace-st., Horsham
2143	Stephens, J. ..	Murray-st., Colac
2180	Stone, G.	Main-st., Cohuna
2141	Sutton, J. S. ..	Beaufort
2194	Taylor, H. G. ..	Birchip
2202	Teasdale, R. L. ..	Charlton
2243	Tellie, N.	Roseberry
2267	Thomas, F. ..	Tintaldra ..
2240	Thomas, S. S. ..	Cr. Wattle and Victoria-st., Bendigo
2269	Thornton, G. J. ..	Corowa
2280	Tolson, L. M. ..	Korumburra and Mirboo North
2235	Trigger, M. E. ..	Pinnaroo, S.A.
2225	Vines, A. A. ..	Robinvale
2237	Voges, A. V. ..	Hamilton
2246	Warnock, R. ..	Flowerdale, via Yea
2182	Waters, S. H. and Co. Pty. Ltd.	514 Little Collins-st., Melbourne (Branches at Benalla, Wangaratta, Hamilton, Casterton, Coleraine, Horsham, and Ararat
2241	Weir, A. R. ..	Berriwillock
2212	Westphalen, W. R. ..	Yaapeet and Rainbow
2145	Wheatland, W. and Co.	Brougham-place, Geelong
2170	Wheaton, C. M. ..	Miram
2166	Wilcox Mofflin Ltd. ..	34 King-st., Melbourne
2223	Wingfield, E. H. ..	High-st., Charlton
2167	Wise, E. M. ..	90 Fyans-st., South Geelong
2275	Schneider, L. .. (For Wodonga Fellmongery and Tannery)	542 Schubark-st., Albury
2126	Wood, H. L. ..	Balmoral
2125	Wright, N. A. ..	High-st., Shepparton
2205	Young, H. ..	Orford
2135	Young's Blue Store Pty. Ltd.	Cumming-ave., Birchip
2262	Zed, A. and Sons ..	Commercial-st., Mt. Gambier

MANGE AND LICE IN PIGS

Mange is a fairly common condition in pigs, and occurs in animals of all ages. The condition may range from severe to mild. The latter is not uncommon in older pigs. The skins of affected pigs are infested with mange mites, but these are hard to see with the naked eye. Chief symptoms in heavy infestations are the thickening and roughening of the skin. The hair is matted and the skin is covered with a layer of yellowish and brown scabs. Parts particularly affected are about the tail, the head and the feet. The severest infections are seen in young pigs. Older pigs seem to develop a resistance although they may be carriers of the mites.

The harmful effects of these parasites are well known to most pig breeders. There is the loss of value due to the appearance of the animal, and the loss of condition due to the irritation caused by the burrowing of the mites into the skin. It is most important to remember that the disease may be transferred readily from one pig to another, and infested pigs should be separated from non-infested animals.

There are various treatments which have been suggested, but the Veterinary Research Institute has discovered a treatment which is cheap and effective as well as harmless to the pig itself. This consists of neatsfoot oil 1 quart, clear soft water 2 quarts, washing soda 2 teaspoonsful, potassium sulphurata 1 ounce. Boil the last three ingredients and then stir in the oil slowly. This will produce a white emulsion. Spray this on the pigs with a hand-spray pump. It is necessary to treat again after four days to kill off any mites which may have hatched from eggs following the first treatment. Routine treatments may be applied at regular intervals.

Lice infestation is indicated by symptoms of irritation such as occur in mange; however, the lice may actually be seen on examination of the pigs.

Infestation may be controlled by applying oil on a bag in a position where the pig can scratch itself. It should be remembered that the eggs of lice may survive up to a month and may hatch out and keep the infection going. For valuable pigs, individual treatment with such powders as derris and pyrethrum will keep lice in check but will not eradicate them. D.D.T. will probably be highly effective in controlling lice. However, insufficient is known of its poisonous properties for general recommendation at present.

[Contributed by the Live Stock Division.]

Standard Herd Records

For Quarter ended 31st March, 1946.

In the following are set out the records of all cows which completed a lactation during the quarter. The number is 463, of which 256 qualified for the certificate. The figure in brackets after the owner's name shows the number of entries.

The amount of butter-fat required for qualification varies with the age class to which the animal belongs, the standard being as follows:—

Junior 2-year old (under 2½ years at time of calving)	230 lb. butter-fat.
Senior 2-year old (between 2½ and 3 years at time of calving) ..	250 lb. butter-fat.
Junior 3-year old (between 3 and 3½ years at time of calving) ..	270 lb. butter-fat.
Senior 3-year old (between 3½ and 4 years at time of calving) ..	290 lb. butter-fat.
Junior 4-year old (between 4 and 4½ years at time of calving) ..	310 lb. butter-fat.
Senior 4-year old (between 4½ and 5 years at time of calving) ..	330 lb. butter-fat.
Mature cow 5 years and over	350 lb. butter-fat.

N.C.K. denotes no chart kept.

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire
Atkinson, W. K., Swan Hill, Dairy Shorthorn (15).										
Willow Park Blush 23rd ..	2329D	273	16½	8,655	3·53	305·5	270	Jr. 3	283 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Comet 33rd ..	2254C	90	4½	3,735	3·42	127·6	330	Sr. 4	255 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Comet 38th ..	2256C	273	4½	5,043	3·64	183·6	290	Sr. 3	176 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Countess 46th	2259C	273	13	7,958	3·34	266·1	290	Sr. 3	249 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 41st..	1525C	210	4	11,190	3·51	392·3	350	Mature	313, 294, 413, 375	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 48th..	1529C	273	30	13,404	3·31	443·7	350	Mature	339, 371, 425	Anderson Imperial Cran 6th (Imp.)
Willow Park Duchess 56th..	2339D	273	17	7,991	3·79	302·8	310	Jr. 4	206, 212 ..	Willow Park Imperial Cran 10th
Willow Park Duchess 62nd..	2343D	273	5	4,695	4·69	220·3	270	Jr. 3	219 ..	Willow Park Barrington 77th
Willow Park Melba 35th ..	1686D	273	17	13,043	3·94	514·2	350	Mature	380, 420, 481, 511	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Melba 54th ..	C.C.	273	20½	6,918	3·68	254·7	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Moss Rose 26th	2347D	273	32	10,440	2·87	299·8	310	Jr. 4	275,339 ..	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Rose Bud 2nd	1448A	273	21	9,860	4·25	418·8	350	Mature	282, 296, 223	Wicklesham Lord Barrington 5th (Imp.)
Willow Park Rosebud 5th	2164A	273	9	4,752	3·31	157·1	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Rosebud 6th	C.C.	273	18	7,050	4·02	283·6	230	Jr. 2	.. ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Camelia 44th..	2179B	273	9	7,947	2·94	233·4	310	Jr. 4	213, 210 ..	Willow Park Barrington 77th
Axford, Estate of W. H., Camperdown, Jersey (16).										
Leura Beauty 20th ..	67603	273	N.C.K.	5,286	4·77	257·1	350	Mature	.. ..	Clarendon Eyre Eminent's Sorcerer
Leura Carmen 4th ..	82404	273	N.C.K.	7,024	4·88	343·0	330	Sr. 4	.. ..	Belgonia Stylish
Leura Dora 15th ..	87439	273	N.C.K.	6,384	4·62	294·7	290	Sr. 3	.. ..	Belgonia Stylish
Leura Dora 19th ..	Vol. 33	273	N.C.K.	6,574	4·94	324·6	250	Sr. 2	.. ..	Navua Fillpails Volunteer
Leura Greta 28th ..	Vol. 33	273	N.C.K.	5,918	5·21	308·3	250	Sr. 2	.. ..	Navua Fillpail's Volunteer
Leura Handsome Girl 9th ..	72402	273	N.C.K.	5,684	5·24	297·6	350	Mature	.. ..	Clarendon Eyre Eminent's Sorcerer
Leura Handsome Girl 12th	82412	273	N.C.K.	6,254	4·43	276·9	330	Sr. 4	.. ..	Clarendon Eyre Eminent's Lohengrin
Leura May 24th	62745	273	N.C.K.	6,539	4·59	300·1	350	Mature	.. ..	Clarendon Eyre Eminent's Lohengrin
Leura May 30th ..	67619	273	N.C.K.	6,858	4·20	288·2	350	Mature	.. ..	Clarendon Eyre Eminent's Lohengrin
Leura May 42nd ..	77348	273	N.C.K.	6,514	4·20	273·9	350	Mature	.. ..	Clarendon Eyre Eminent's Lohengrin

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Axford, Estate of W. H., Camperdown, Jersey—*continued.*										
Leura May 46th ..	82420	273	N.C.K.	6,747	4·56	307·4	330	Sr. 4	.. ..	Belgonia Stylish Volunteer
Leura May 67th ..	C.R.	273	N.C.K.	5,455	4·62	252·0	230	Jr. 2	.. ..	Navua Fillpail's
Leura Patricia 57th ..	Vol. 33	273	N.C.K.	5,991	4·47	267·8	250	Sr. 2	.. ..	Belgonia Stylish
Leura Piccaninny 15th ..	77356	273	N.C.K.	5,180	4·99	258·5	350	Mature	.. ..	Clarendon Eyre Eminent's Lohengrin
Leura Piccaninny 16th ..	82433	273	N.C.K.	9,859	5·55	547·6	330	Sr. 4	.. ..	Belgonia Stylish
Leura Princess Larkspur ..	Vol. 33	273	N.C.K.	4,931	4·98	245·6	230	Jr. 2	.. ..	Belgonia Stylish
Ballarat Orphanage, Ballarat, Jersey (8).										
Gowanlea Oxford Gipsy ..	37788	273	13½	6,022	5·29	318·3	350	Mature	324, 387, 488, 415, 367, 362, 324, 279	Oxford Beau's Pretty Oxford
Orphanage Aria 3rd ..	Vol. 33	273	13½	5,141	4·03	253·7	230	Jr. 2	.. ..	Banyule Gull
Orphanage Attraction 18th	83287	273	21	7,653	5·32	406·9	350	Mature	308, 320, 371	Banyule Terraplane
Orphanage Attractive 14th	88369	273	N.C.K.	6,837	4·63	316·5	330	Sr. 4	328, 428 ..	Orphanage Centaurus
Orphanage Dawn ..	Vol. 31	273	N.C.K.	7,590	5·96	452·7	270	Jr. 3	379 ..	Clarendon Eyre Oxford Observer
Orphanage Melba 14th ..	68461	273	N.C.K.	4,827	4·92	237·4	350	Mature	433, 444, 465, 343, 352	Banyule Terraplane
Orphanage Molly 22nd ..	C.R.	273	16	6,465	5·07	328·0	270	Jr. 3	229 ..	Banyule Terraplane
Uphaven Silver Dawn ..	79350	273	N.C.K.	6,755	5·22	352·8	350	Mature	313, 393, 367, 424	Banyule Terraplane
Barkla, R. E. and Sons, Joyce's Creek, Jersey (6).										
Green Gully Dawn ..	86648	273	13	5,139	5·02	258·0	350	Mature	187, 237, 212	Orphanage Major
Joyce's Creek Daylight ..	C.R.	273	10½	4,383	4·97	218·0	290	Sr. 3	154 ..	Orphanage Major
Joyce's Creek Mercy ..	C.R.	273	8½	3,701	5·04	186·6	290	Sr. 3	245 ..	Joyce's Creek Thorn
Joyce's Creek Molly ..	87018	273	12	5,828	4·98	290·0	330	Sr. 4	247, 295 ..	Balcairn Dawn's Masterpiece
Joyce's Creek Poppy ..	C.R.	273	11	4,638	5·78	267·9	290	Sr. 3	250 ..	Orphanage Major
Joyce's Creek Princess ..	C.R.	273	7	3,276	5·16	169·1	250	Sr. 2	.. ..	Orphanage Major
Barker, Mrs. E. M., Richardson, G. H. and Hornsby, F. C., Vervale, Jersey (1).										
Karoola Janifer	87091	273	N.C.K.	8,985	5·34	479·4	290	Sr. 3	.. ..	Somerville Master Babs
Bennett, J. W., Yinnar, Jersey (7).										
Ellendale Bluebell 26th ..	86093	273	N.C.K.	6,381	5·02	320·4	290	Sr. 3	290 ..	Avalon Prince Madeira
Ellendale Bluebell 30th ..	Vol. 31	273	N.C.K.	5,960	5·64	336·4	270	Jr. 3	335 ..	Avalon Prince Madeira
Ellendale Bluebell 35th ..	Vol. 33	273	N.C.K.	4,326	5·05	218·3	230	Jr. 2	.. ..	Carellen Butter King
Ellendale Duchess 5th ..	76081	273	N.C.K.	6,962	5·27	367·0	350	Mature	458, 492, 435, 382	Avalon Prince Madeira
Ellendale Duchess 11th ..	86096	273	N.C.K.	6,597	4·90	323·4	330	Sr. 4	313 ..	Ellendale Banksia 2nd Bellboy
Ellendale Duchess 13th ..	91862	273	N.C.K.	5,618	5·27	295·9	290	Sr. 3	326 ..	Avalon Prince Madeira
Ellendale Duchess 14th ..	Vol. 31	273	N.C.K.	5,552	4·83	268·4	270	Jr. 3	291 ..	Avalon Prince Madeira
Bennett, R. H., and Sons, Lancefield, Jersey (6).										
Edenhope Countess ..	66800	273	15½	6,795	6·14	417·4	350	Mature	326, 388, 387, 366, 448	Edenhope Masterpiece
Edenhope Ettie	Vol. 33	273	13½	5,750	5·55	318·9	230	Jr. 2	.. ..	Karrara Standard Beau
Edenhope Iris	76034	273	11	7,511	5·70	428·2	350	Mature	324, 328, 394 421, 517	Jindivick Defiance
Edenhope Madeira's Peggy	91761	273	12½	4,688	5·95	279·0	290	Sr. 3	271 ..	Karrara Standard Beau
Edenhope Queenie ..	66306	273	16	7,971	5·53	441·1	350	Mature	412, 455, 401, 469, 547	Edenhope Masterpiece
Edenhope Rosetta ..	76038	273	16	7,352	5·56	408·5	350	Mature	482, 391, 419, 493	Edenhope First Choice
Black, Estate of the late I. S., Noorat, Ayrshire (5).										
Mount Noorat Alert 9th ..	32803	273	19	9,645	4·28	412·4	350	Mature	332, 235, 172, 291	Mount Noorat Gerontius
Mount Noorat Alert 18th ..	35699	273	6	5,883	4·90	288·5	310	Jr. 4	224 ..	Gowrie Park Bonnie Standard
Mount Noorat Georgina 5th	29777	273	16	10,608	4·15	440·4	350	Mature	379, 318, 466, 415, 406, 371, 298	Gowrie Park Scottish Patron
Mount Noorat Kitty ..	31638	273	15	6,558	4·52	296·6	250	Sr. 2	.. ..	Sandhill Kipling
Mount Noorat Teshu Mai ..	35704	273	7	8,265	4·43	365·9	310	Jr. 4	210, 284 ..	Sandhill Kipling
Broad, Mrs. A. A., Sutton Grange, Jersey (7).										
Grangelea Bunty's Maid ..	66750	273	20	7,380	5·35	394·8	350	Mature	341, 379, 380, 377, 431	Grangelea Roderick 2nd
Grangelea Damsel 8th ..	92673	273	N.C.K.	6,323	5·36	339·1	250	Sr. 2	.. ..	Navua Wonderful Count
Grangelea Dorothy ..	92675	273	21	5,845	4·56	266·4	250	Sr. 2	.. ..	Navua Wonderful Count
Grangelea Petal	81596	273	17½	6,188	5·67	350 8	330	Sr. 4	267, 332 ..	Banyule Macon
Grangelea Petal 2nd ..	86627	273	N.C.K.	5,852	5·84	341·7	290	Sr. 3	277 ..	Banyule Macon
Grangelea Ramona 2nd ..	86632	273	N.C.K.	6,081	4·68	284·5	270	Jr. 3	233 ..	Navua Wonderful Count
Grangelea Vera	86638	273	16	5,508	5·69	313·3	270	Jr. 3	265 ..	Navua Wonderful Count

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk last day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard required.	Class.	Previous Yields of Butter Fat.	Sire.
Broad, A. J., Pyramid, Jersey (3).										
Lynlea Duchess ..	Vol. 31	273	12¼	4,050	6·90	279·4	290	Sr. 3	257 ..	Grangelea Robert 3rd
Lynlea Rose Petal 3rd	82555	273	19½	5,864	6·48	379·8	350	Mature	277, 320, 404	Grangelea Max
Lynlea Rose Petal 4th	93937	273	N.C.K.	3,885	5·69	221·2	230	Jr. 2	.. ..	Grangelea Max
Broad, E. E., Pyramid, Jersey (1).										
Grangelea Rosette 3rd ..	71634	273	N.C.K.	5,883	6·03	355·0	350	Mature	325 ..	Grangelea Cream Boy
Bruhn, C. H., Mirboo North, Jersey (3).										
Dellara Queenie ..	85943	273	N.C.K.	8,108	6·07	492·3	290	Sr. 3	.. ..	Tooravale Alpha
Lumeah Cynthia	87520	240	N.C.K.	5,760	5·79	333·3	350	Mature	398, 400 ..	Hazelgrange Minnie's Master
Lumeah Lady Aster	77428	150	N.C.K.	2,010	5·04	101·3	350	Mature	330, 369, 439	Hazelgrange Minnie's Master
Burgman, F. A., Katandra West, Jersey (1).										
Katandra Princess ..	93339	273	18	5,701	5·83	332·4	290	Sr. 3	.. ..	Katandra Aconite Standard
Butcher, F. T., Swan Hill, Red Poll (1).										
Maryville Susie ..	8023C	273	20	7,665	3·98	304·9	350	Mature	281, 290, 283, 270	Temperley Prism
Callahan, P. and Sons, Barwon Downs, Dairy Shorthorn (3).										
Tallandoon Beauty ..	1631D	273	N.C.K.	7,165	3·78	270·6	350	Mature	.. ..	Poplar Vale Prince
Tallandoon Cherub 4th ..	2652E	273	N.C.K.	4,737	4·63	219·9	350	Mature	.. ..	Willow Park Banker 17th
Tallandoon Colleen ..	C.C.	273	N.C.K.	6,245	4·05	252·8	290	Sr. 3	.. ..	Willow Park Banker 17th
Candler, G. E., Hamilton, Ayrshire (2).										
Jennewar Bunty ..	34708	273	13	6,519	4·46	290·5	350	Mature	266, 245, 172	Denbigh Ace
Jennewar Minnie 3rd ..	36455	273	20¼	9,873	4·36	430·3	290	Sr. 3	322 ..	Inverurie Lauchie
Carne, W. J., Pakenham Upper, Jersey (1).										
Navuloa Master's Ladybird	63365	273	N.C.K.	8,322	5·04	419·7	350	Mature	383, 435, 454, 359, 506	Werribee Grandmaster
Chadderton, J. E., Hamilton, Jersey (6).										
Glen Leigh Dancer ..	76345	273	15	5,475	5·31	290·7	330	Sr. 4	247, 306, 354	Glen Leigh Volunteer
Glen Leigh De Luxe 2nd ..	86368	273	19½	6,299	5·16	325·3	250	Sr. 2	.. ..	Selsey Taxpayer
Glen Leigh De Luxe 3rd ..	92293	273	11½	4,475	5·83	260·7	230	Jr. 2	.. ..	Selsey Taxpayer
Glen Leigh Destiny 7th ..	81448	273	20½	6,693	6·00	417·5	330	Sr. 4	338, 354 ..	Selsey Taxpayer
Glen Leigh Dolly 3rd ..	52824	273	20½	7,536	4·79	360·8	350	Mature	354, 272, 463, 421, 357, 358	Glen Leigh Bounty
Glen Leigh Duchess 8th ..	92297	273	6	3,322	6·19	205·7	230	Jr. 2	.. ..	Selsey Taxpayer
Charlton, Geo. F., Stoney Creek, Jersey (3).										
Lumeah Marie ..	93882	273	N.C.K.	6,692	6·01	402·1	290	Sr. 3	.. ..	Wonga Park Norma's Ace
Lumeah Primula ..	67695	273	N.C.K.	8,954	5·25	470·0	350	Mature	.. ..	Hazelgrange Minnie's Master
Mer-vue Butterball 2nd ..	77700	273	N.C.K.	6,947	6·71	465·9	350	Mature	304, 399, 441	Mer Vue Great Boy
Chirnside, R. M., Whittlesea, Jersey (2).										
Mornmoot Princess Madeira 9th	58569	273	36	11,177	5·70	637·0	350	Mature	426, 551, 661, 632, 652, 565	Werribee Warrior
Mornmoot Princess Madeira 21st	72952	273	41	12,009	5·09	611·2	350	Mature	460, 588, 634	War Valour (Imp.)
Clarke, F. W., Toora, Jersey (1).										
Mer Vue Choice Light ..	94214	273	N.C.K.	9,228	6·14	567·0	330	Sr. 4	343, 431 ..	Mer-vue Jupiter
Clark, P. W. and Son, Whittlesea, Jersey (5).										
Coodardy Aldan's Glorious	75735	273	19	7,138	5·90	421·1	350	Mature	456, 618, 525 529	Staghorn Lord Aldan 3rd
Coodardy Wyandotte ..	85725	273	20	8,166	4·69	382·7	350	Mature	503, 476, 497	Werribee Centurion
Coodardy Wyandotte 2nd ..	85726	273	17	5,423	5·55	301·4	290	Sr. 3	369 ..	Brucevale Lord Rupert
Werribee Lillian	79584	273	16	6,995	5·64	394·7	330	Sr. 4	325, 347 ..	Staghorn Master Clement
Coodardy Gentle Annette 6th	61158	273	9	5,359	5·39	288·8	350	Mature	319, 469, 424, 374	Staghorn Lord Aldan 3rd

Name of Cow	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.		Sire.
Colenso, L. W., Alvie, Jersey (7).											
Normandie Hawthorn 15th	68361	273	30½	9,393	5·04	473·8	350	Mature	303, 360, 557, 588, 450, 442		Lewisham Playboy
Normandie Hawthorn 32nd	Vol. 33	273	15½	4,002	4·10	164 2	230	Jr. 2	..	..	Normandie Jolly Boy
Normandie Ilma 27th ..	Vol. 33	273	16	5,286	4·45	235 2	230	Jr. 2	..	..	Normandie Jolly Boy
Normandie Lady 2nd ..	78138	273	22	7,418	5·27	390·7	350	Mature	..	..	Normandie Majestic
Normandie Lady 4th ..	Vol. 31	273	8½	7,271	4·93	358·6	250	Sr. 2	279	..	Normandie Jolly Boy
Normandie Primrose 11th..	Vol. 33	273	15	3,962	4·9	194·3	230	Jr. 2	..	..	Normandie Jolly Boy
Normandie Thelma 8th ..	78140	273	25½	8,402	4·40	369·9	350	Mature	282, 362, 349		Lewisham Playboy
Coulthard, J. J., Whittlesea, Jersey (3).											
Walamba Bubbles 2nd ..	Vol. 31	273	10	4,895	4·26	208·7	270	Jr. 3	262	..	The Wattles Gamboge 3rd
Walamba Merry Queen ..	C.R.	273	9	4,293	4·73	203·1	250	Sr. 2	246	..	The Wattles Gamboge 3rd
Walamba Sally Grey ..	Vol. 33	273	18	5,006	4·46	223·4	230	Jr. 2	..	..	The Wattle Gamboge 3rd
Cowan, G. L. S., Bacchus Marsh, Friesian (3).											
Upper Lappan Empress ..	C.R.	273	N.C.K.	6,869	3·71	255·0	250	Sr. 2	..	..	Lerderderg Top Gallant
Upper Lappan Ramona 2nd	7132	273	N.C.K.	10,512	3·25	341·7	330	Sr. 4	258, 318	..	Upper Lappan Pontiac
Upper Lappan Shepherdess	7133	273	N.C.K.	10,249	3·58	367·0	350	Mature	290, 321, 353		Upper Lappan Pontiac
Crawford, Mrs. E., Loy Yang, Jersey (13).											
Balneil April Duchess ..	90294	273	N.C.K.	5,632	5·38	303·0	270	Jr. 3	..	..	Balneil Masters Volunteer
Balneil Golden Lotina ..	90302	273	N.C.K.	6,719	4·94	331·6	290	Sr. 3	..	..	Balneil Golden Twylish
Balneil Grandmistress ..	90303	273	N.C.K.	4,995	5·03	251·2	230	Jr. 2	..	..	Balneil Masters Volunteer
Balneil Lady Madeira ..	90306	273	N.C.K.	4,819	5·85	282·0	230	Jr. 2	..	..	Balneil Starbright's King
Balneil Larkspur's Voluntress	90309	273	N.C.K.	6,152	4·87	299·7	230	Jr. 2	..	..	Balneil Master's Volunteer
Balneil Master's Duchess ..	65314	273	N.C.K.	6,136	5·43	333·0	350	Mature	404	..	Werribee Royal Master
Balneil Master's Idyll ..	65315	273	N.C.K.	6,246	5·37	335·3	350	Mature	375, 360	..	Werribee Royal Master
Balneil Master's Melba ..	90314	273	N.C.K.	5,213	5·93	309·2	250	Sr. 2	..	..	Balneil Master's Volunteer
Balneil Master's Starbright 2nd	90316	273	N.C.K.	5,202	5·42	281·8	230	Jr. 2	..	..	Balneil Master's Volunteer
Balneil Sultane Starbright	90333	273	N.C.K.	5,346	5·66	302·6	230	Jr. 2	..	..	Balneil Master's Volunteer
Balneil Sultane Starbright 2nd	90334	273	N.C.K.	3,602	5·76	207·5	230	Jr. 2	..	..	Balneil Master's Volunteer
Balneil Voluntress ..	90337	273	N.C.K.	5,010	5·0	295·3	230	Jr. 2	..	..	Balneil Master's Volunteer
Balneil Miss Valour ..	90322	273	N.C.K.	3,768	5·7	214·7	230	Jr. 2	..	..	Balneil Master's Volunteer
Cuddihy, T. D., Geelong, Jersey (3).											
Mount Violet Fairy Madeira	72974	273	N.C.K.	5,658	4·38	247·7	350	Mature	352, 334, 248, 220		Mount Violet Madeira's Count
Pine Ridge Hawthorn 7th..	83471	273	N.C.K.	4,310	4·63	199·4	330	Sr. 4	185, 232, 148		Belgonia Magnetic Chief
Pine Ridge Silvermine 9th..	83474	273	N.C.K.	2,837	5·34	151·6	330	Sr. 4	179, 125	..	Belgonia Magnetic Chief
Dennis, Mrs. A. A., Frankston, Jersey (1).											
Ballam June	75003	273	13	5,819	5·96	347·1	330	Sr. 4	337, 422, 366		The Wattles Gamboge Prince
Department of Agriculture, Werribee, Friesian (3).											
Victoria Belfris	7140	273	23	11,375	3·66	416·6	270	Jr. 3	432	..	Terling Hypothesis (Imp.)
Victoria Lyric	C.R.	273	30	9,843	3·21	315·8	250	Sr. 2	..	..	Terling Hypothesis (Imp.)
Victoria Olga	7157	273	48	14,853	3·41	506·3	290	Sr. 3	433	..	Terling Hypothesis (Imp.)
Department of Agriculture, Werribee, Red Poll (10).											
Victoria Altar	C.R.	273	4	4,677	5·03	235·2	230	Jr. 2	..	..	Victoria Petrology
Victoria Bessie	7009A	273	5	6,622	3·45	228·4	350	Mature	316, 339, 450, 283, 306, 373		Woodburn Peter Pan
Victoria Betsy	A. Vol. 13	273	5	5,619	4·71	264·9	270	Jr. 3	..	..	Burnwood Masterpiece
Victoria Cheery Cross ..	C.R.	273	6½	3,911	4·09	160·0	230	Jr. 2	..	..	Woodburn Peter Pan
Victoria Dolories ..	A. Vol. 13	273	14	7,445	4·35	324·2	270	Jr. 3	291	..	Woodburn Peter Pan
Victoria Lady Plush ..	AA. Vol. 13	273	15½	6,363	4·75	302·4	250	Sr. 2	..	..	Woodburn Peter Pan
Victoria Maid Marion ...	5690AA	273	8	7,461	4·38	326·8	350	Mature	316, 437, 445, 426, 349, 371, 314, 407		Woodburn Peter Pan
Victoria Matrimony ..	9152AA	273	7½	6,047	4·12	249·1	350	Mature	287, 241, 290, 268		Woodburn Peter Pan
Victoria Petunia	9158AA	273	14	6,846	5·11	349·6	330	Sr. 4	352, 417	..	Burnwood Masterpiece
Victoria Phlora	9159A	273	23	7,876	3·59	283·1	270	Jr. 3	315	..	Burnwood Masterpiece
Desmond, J. J., Rochester, Jersey (2).											
Macroom Duchess 2nd ..	C.R.	273	N.C.K.	6,932	5·41	374·9	270	Jr. 3	330	..	Clifford Farm Robin Adair
Rochester Countess 2nd ..	88756	273	N.C.K.	6,086	6·29	382·9	350	Mature	..	..	Leven Brae A'do Clem

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Devon Park Stud Farm (G. S. Daley), Lilydale , Jersey (1).										
Devon Park Pioneer Clementine	85968	273	N.C.K.	4,849	6·20	300·8	270	Jr. 3	291 ..	Karrara Sporting Standard
Dookie Agricultural College, Dookie, Ayrshire (6).										
Dookie Dahlia	Vol. 38	273	N.C.K.	3,714	4·27	158·5	230	Jr. 2	.. ..	Dookie Radiant
Dookie Flapper	Vol. 38	273	N.C.K.	5,053	3·30	166·9	230	Jr. 2	.. ..	Gowrie Park Bonnie Sailor
Dookie Lupin	Vol. 38	273	N.C.K.	5,128	3·25	166·5	230	Jr. 2	.. ..	Gowrie Park Royal Crest
Dookie Peace	Vol. 37	273	N.C.K.	5,358	4·12	220·5	290	Sr. 3	247 ..	Dookie Radiant
Dookie Primula	Vol. 38	273	N.C.K.	5,100	3·65	186·0	230	Jr. 2	.. ..	Dookie Radiant
Dookie Sable	Vol. 38	273	N.C.K.	5,219	3·24	169·3	230	Jr. 2	.. ..	Gowrie Park Royal Crest
A. E. Dowel, Loch, Jersey (1).										
Wattle Vale Belle	Vol. 33	273	N.C.K.	8,598	4·82	414·4	250	Sr. 2	.. ..	Werribee Valiant
Dunmore, T. J., Melton, Jersey (1).										
Laura Dell Rosette ..	93654	273	16	5,393	5·51	297·2	230	Jr. 2	.. ..	Laura Dell Cariad's Aim
Emmett, Mrs. S. and Sons, Stanhope, Jersey (4).										
Shenstone Dawn 3rd ..	Vol. 33	273	N.C.K.	5,779	5·02	290·2	230	Jr. 2	.. ..	The Wattles Young Gamboge 4th
Shenstone Golden Morn ..	68257	273	N.C.K.	7,173	5·67	406·9	330	Sr. 4	.. ..	Pine Ridge Golden Duke
Shenstone Goldie 3rd ..	95699	273	N.C.K.	6,048	4·97	300·3	330	Sr. 4	.. ..	Pine Ridge Golden Duke
Shenstone Sally	68258	273	N.C.K.	7,005	4·89	342·6	330	Sr. 4	.. ..	Pine Ridge Golden Duke
Fairchild and Clutterbuck, Tinamba, Jersey (6).										
Carellen Wyandotte ..	65881	273	N.C.K.	8,750	5·15	540·2	350	Mature	353, 412, 400	Darnum Park Lord Starbright
Vaucluse Pansy 3rd ..	84391	273	N.C.K.	5,668	5·99	339·3	330	Sr. 4	328,315 ..	Vaucluse Masterpiece
Vaucluse Trilby 3rd ..	96403	273	N.C.K.	6,477	5·21	337·5	270	Jr. 3	.. ..	Vaucluse Masterpiece
Vaucluse Warden's Girl ..	Vol. 32	273	N.C.K.	5,663	5·12	289·9	230	Jr. 2	.. ..	Mornmoot War Warden
Vaucluse Warden's Tinsel	Vol. 33	240	N.C.K.	3,825	5·6	214·3	230	Jr. 2	.. ..	Mornmoot War Warrior
Vaucluse Warden's Trilby	Vol. 33	273	N.C.K.	5,585	5·61	313·3	230	Jr. 2	.. ..	Mornmoot War Warden
Fixter, A., Boisdale, Guernsey (2).										
Avonview Dot 2nd ..	9867	273	18½	8,093	5·28	427·4	290	Sr. 3	302, 349 ..	Avonview Monogram 12th
Avonview Jean	6729	273	22	8,090	5·50	445·3	350	Mature	351, 417, 382, 481, 458, 417	Kentdale Monogram
Francis, W. C., Swan Hill, Jersey (2).										
Ryelands Dainty Style ..	95602	273	N.C.K.	6,745	4·71	317·6	290	Sr. 3	357 ..	Pine Ridge Stylish
Ryelands Rose Morn		273	N.C.K.	6,108	4·53	276·5	350	Mature	253, 312 ..	Banoview Master
Fraser, S. T., Terang, Jersey (2).										
Glenvalley Coral Sand 9th..	92581	273	N.C.K.	5,682	5·67	322·0	230	Jr. 2	.. ..	Bangor Stumpy's Boy
Normandie Lady 3rd ..	83192	273	N.C.K.	8,183	6·8	556·5	330	Sr. 4	.. ..	Lewisham Playboy
Gay, W. C. R., Yarram, Jersey (2).										
Elm Grove Buttercup 3rd..	61461	273	N.C.K.	8,090	5·16	417·3	350	Mature	264, 499, 459, 365, 433	Elm Grove Graceful Masterpiece
Elm Grove Linda 8th ..	76115	273	N.C.K.	8,685	5·30	460·6	350	Mature	306, 366, 400, 414	Glen Iris Golden Man
Gleeson, T. F., Tynong, Jersey (4).										
Glenavon Molly 7th ..	76377	273	N.C.K.	6,672	4·58	305·9	350	Mature	.. ..	Glenavon Airtrail
Glenavon Molly 8th ..	86397	273	N.C.K.	5,565	6·09	338·8	330	Sr. 4	.. ..	Glenavon Maystar
Kooyneira Golden Beauty	93552	273	N.C.K.	8,115	6·23	505·3	290	Sr. 3	.. ..	Colyton Aristocrat
Tarwin View Silver Bell ..	84123	273	N.C.K.	5,882	5·74	337·6	350	Mature	.. ..	Glen Iris Golden Joy
Handbury, J. E. and Son, Toora, Jersey (2).										
Tooravale Lassie 40th ..	84242	273	N.C.K.	8,869	5·57	494·3	350	Mature	252, 388, 331, 470	Tooravale Noble
Tooravale May 10th ..	Vol. 31	273	N.C.K.	10,388	5·37	557·8	330	Sr. 4	323, 419, 477	Pinewoods Aristocrat (Imp.)

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Handbury, W., Toora, Jersey (11).										
Colyton Lassie Fowler 5th..	85677	273	N.C.K.	6,627	4·91	325·3	330	Sr. 4	.. ..	Glen Iris Dandy's Sultan
Colyton Lassie Fowler 7th..	85679	273	N.C.K.	2,882	3·91	112·6	290	Sr. 3	.. ..	Glen Iris Dandy's Sultan
Colyton Lassie Fowler 9th..	91252	273	N.C.K.	5,240	5·32	278·7	250	Sr. 2	.. ..	Tooravale Axis
Colyton May Queen 3rd ..	85681	273	N.C.K.	8,085	4·78	386·8	330	Sr. 4	.. ..	Tooravale Noble
Colyton Milkmaid 11th ..	91265	273	N.C.K.	6,696	4·87	326·0	290	Sr. 3	.. ..	Glen Iris Dandy's Sultan
Colyton Milkmaid 12th ..	91266	240	N.C.K.	3,090	5·20	160·6	250	Sr. 2	.. ..	Glen Iris Dandy's Sultan
Colyton Milkmaid 13th ..	91267	273	N.C.K.	4,389	5·0	219·5	250	Sr. 2	.. ..	Glen Iris Dandy's Sultan
Colyton Royal Rose 2nd ..	91278	210	N.C.K.	4,770	5·30	252·7	290	Sr. 3	.. ..	Pinewoods Aristocrat (Imp.)
Colyton Starleigh 5th ..	91282	273	N.C.K.	4,940	5·93	292·9	270	Jr. 3	.. ..	Glen Iris Dandy's Sultan
Tooravale Milkmaid 34th ..	84285	273	N.C.K.	6,086	5·30	322·8	350	Mature	.. ..	Tooravale Monica's Sons'
Colyton Royal Rose 3rd ..	Vol. 32	273	N.C.K.	4,878	5·53	269·8	290	Sr. 3	.. ..	Glen Iris Dandy's Sultan
Hardie, R. B., Lardner, Jersey (4).										
Glen Urquhart Golden Holly	Vol. 33	273	18	6,834	5·10	348·8	230	Jr. 2	.. ..	Bellefaire Golden Chevron
Glen Urquhart Golden Marie	Vol. 32	273	11	5,200	5·77	300·0	290	Sr. 3	420 ..	Bellefaire Golden Chevron
Lumeah Jeanette ..	72510	273	26	8,673	4·43	384·3	350	Mature	395, 379 ..	Pine Leigh Butterwinks 2nd
Ovalau Masterpiece's Cream	93320	273	24½	7,394	4·54	336·0	350	Mature	333, 436, 482, 374, 475	Staghorn Laburnum's Masterpiece
Harris, J. W. and Son, Yinnar, Jersey (1).										
Glenvalley Handsome Girl 14th	92591	273	N.C.K.	4,426	6·12	270·9	230	Jr. 2	.. ..	Bangor Stumpy's Boy
Hartley, C. G., Dandenong, Jersey (2).										
Devon Glen Little Queen 2nd	85963	273	N.C.K.	7,458	5·68	423·5	350	Mature	346, 282, 375	Wonga Park Song King
Woodlands Daffodil ..	89715	273	N.C.K.	5,664	5·75	325·6	330	Sr. 4	271 ..	Werribee Jupiter
Harvey, T., Boisdale, Jersey (10).										
Jerseyholm Bluebell 32nd ..	62304	273	N.C.K.	8,976	5·69	511·1	350	Mature	377, 285, 387, 493, 507	Jerseyholm Master's Fox 35th
Jerseyholm Bluebell 47th ..	71962	273	N.C.K.	5,432	4·56	247·8	350	Mature	320, 330, 436, 488	Glen Iris Royal Archer
Jerseyholm Bluebell 67th ..	81958	273	N.C.K.	10,229	4·43	453·6	310	Jr. 4	334 ..	Orphanage Molly's Commander
Jerseyholm Bluebell 69th ..	81959	273	N.C.K.	6,471	4·76	307·9	290	Sr. 3	301, 374 ..	Mornmoot Menmon 2nd
Jerseyholm Empress 78th ..	81960	273	N.C.K.	7,508	5·99	449·6	330	Sr. 4	311, 399 ..	Orphanage Molly's Commander
Jerseyholm Empress 86th	81966	273	N.C.K.	7,175	5·65	405·7	290	Sr. 3	345 ..	Mornmoot Menmon 2nd
Jerseyholm Kirsty 41st ..	71977	273	N.C.K.	6,368	5·03	320·4	350	Mature	280, 303, 337	Mornmoot Menmon 2nd
Jerseyholm Kirsty 42nd ..	71978	273	N.C.K.	8,711	5·26	458·1	350	Mature	268, 327, 399	Orphanage Molly's Commander
Jerseyholm Kirsty 43rd ..	81967	273	N.C.K.	5,534	5·41	299·3	330	Sr. 4	290,304 ..	Orphanage Molly's Commander
Jerseyholm Lady Marge 17th	67197	273	N.C.K.	6,223	5·36	333·5	350	Mature	278, 131, 250, 394, 369	Rowallan Silvanite
Haywood, Dr. A. R., Hastings, Jersey (10).										
Glen Iris Royal Viola ..	71422	273	48	11,472	5·23	599·5	350	Mature	323, 426, 495, 354, 577	Glen Iris Royal Gallant
Windrest Chevy's Betty ..	Vol. 31	273	26	7,450	6·0	446·8	350	Mature	482, 356, 361, 427	Gadget (Imp.)
Windrest Chevy's Dainty ..	74577	273	27	9,186	5·06	464·9	350	Mature	357, 533, 497, 461, 402, 366	Gadget (Imp.)
Windrest Chevy's Maiden	79658	273	31	10,479	5·57	584·1	350	Mature	468, 627, 459, 574	Gadget (Imp.)
Windrest Gadget's Love ..	Vol. 31	273	26	7,563	5·23	395·7	270	Jr. 3	367 ..	Gadget (Imp.)
Windrest Gadget's Rose ..	89672	273	39½	10,379	5·38	558·1	350	Mature	380, 487 ..	Gadget (Imp.)
Windrest Gay Marie 3rd ..	84592	273	30	8,145	6·05	492·7	350	Mature	514, 382, 523	Gadget (Imp.)
Windrest Island Serene ..	79160	273	31	9,948	5·36	533·0	350	Mature	462, 493, 231, 521	Gadget (Imp.)
Windrest Island Starbright..	79661	273	32½	9,648	4·34	418·9	350	Mature	410, 453, 486	Windrest Dreaming Pioneer
Windrest Island View ..	74580	273	35	10,357	4·90	507·0	350	Mature	414, 493, 540, 456, 548, 505	Gadget (Imp.)
Hore, E., Leitchville, Jersey (13).										
Milvue Aim's Bettwys ..	87850	273	N.C.K.	7,709	5·05	389·5	290	Sr. 3	305, 376 ..	Belgonia Peggy 11th's Aim
Milvue Aim's Dainty ..	82841	273	N.C.K.	7,349	5·66	416·0	350	Mature	345, 391, 444	Belgonia Peggy 11th's Aim
Milvue Bettwy's 5th ..	Vol. 33	273	N.C.K.	5,940	4·64	275·7	230	Jr. 2	.. ..	Belgonia Designer
Milvue Design's Bettwys ..	72839	273	N.C.K.	9,854	4·74	467·2	350	Mature	353, 459, 487, 483, 514	Milvue Rosalind's Ruler
Milvue Design's Dainty 5th	Vol. 33	273	N.C.K.	5,319	4·52	240·3	230	Jr. 2	.. ..	Milvue Design's Twylish
Milvue Design's Honesty 4th	72841	273	N.C.K.	6,147	5·34	328·5	350	Mature	352, 468, 510, 470	Belgonia Suspense's Design
Milvue Larkspur 5th ..	87864	273	N.C.K.	5,724	5·67	324·7	290	Sr. 3	313, 376 ..	Belgonia Peggy 11th's Aim
Milvue Moleen	Vol. 33	273	N.C.K.	7,134	4·77	340·6	230	Jr. 2	.. ..	Belgonia Designer
Milvue Rosebud 3rd ..	82857	273	N.C.K.	5,579	5·66	315·8	350	Mature	339, 397, 416, 346	Belgonia Suspense's Design
Milvue Rosebud 5th ..	87867	273	N.C.K.	4,860	5·43	264·0	270	Jr. 3	275 ..	Belgonia Suspense's Design
Milvue Rosebud 6th ..	Vol 33	273	N.C.K.	5,052	4·98	251·7	230	Jr. 2	.. ..	Belgonia Designer
Milvue Silvermine ..	Vol. 33	273	N.C.K.	6,183	5·29	327·2	250	Sr. 2	.. ..	Belgonia Design's Aim
The Wattles Moleen 12th ..	Vol. 33	273	N.C.K.	7,332	4·78	350·6	250	Sr. 2	325 ..	Sweethaven Oxford Count

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Hore, M. T., Horfield, Friesian (6).										
Elmar Fashion	6540	273	N.C.K.	14,070	3·39	476·7	350	Mature	251, 362, 387	Burnbank Iona Rock
Elmar Galaholme ..	C.R.	273	N.C.K.	8,722	3·02	263·2	310	Jr. 4	259,297 ..	Elmar Majoe Galatea
Elmar Lupin	App. 1, Vol. 15	273	N.C.K.	10,101	3·09	312·0	350	Mature	263, 313, 365	Burnbank Iona Rock
Elmar Monica 4th ..	C.R.	273	N.C.K.	6,408	3·33	213·5	270	Jr. 3	207 ..	Burnbank Iona Rock
Elmar Multi Majoe ..	6547	273	N.C.K.	8,205	2·95	242·3	270	Jr. 3	240 ..	Burnbank Iona Rock
Elmar Rock Keyes ..	App. 2, Vol. 15	273	N.C.K.	9,174	2·87	263·5	350	Mature	340, 339, 439, 316, 450	Burnbank Iona Rock
Hurrey, Estate of the late W. H., Koonwarra, Jersey (2).										
Koreena Audrey 19th ..	C.R.	273	N.C.K.	5,334	6·07	323·6	230	Jr. 2	.. ..	Leven Brae A'do Masterpiece
Kooreena Yo Yo 15th ..	C.R.	273	N.C.K.	6,664	6·33	421·7	230	Jr. 2	.. ..	Leven Brae A'do Masterpiece
Jackson, H., Lockington, Jersey (3).										
Lockington Duke's Buttercup ..		273	23½	7,456	4·99	372·2	250	Sr. 2	362 ..	Bellaire Grenadier
Pine Ridge Molly 8th ..	88551	273	24	7,267	5·14	373·5	250	Sr. 2	304 ..	Belgonia Magnetic Chief
Surrey Buttercup 17th ..	..	273	7½	7,173	5·61	402·7	290	Sr. 3	448, 504 ..	Orphanage Attraction's Knight
Jardine, W. R., Leongatha, Jersey (2).										
Derrans Vale Dawn ..	81037	273	N.C.K.	6,170	6·16	380·0	330	Sr. 4	.. ..	Sylvan Hill Emblem
Irona Designer's Delilah ..	Vol. 33	240	N.C.K.	5,355	5·67	303·6	250	Sr. 2	.. ..	Navua Sociable Designer
Johnson, F., Horsham, Jersey (6).										
Devon Park Standard Daisy	85971	273	N.C.K.	5,465	5·73	313·4	330	Sr. 4	201, 288 ..	Brampton Sporting Standard (Imp.)
Orphanage Audrey's Molly 9th	78244	273	N.C.K.	5,922	5·67	335·7	350	Mature	297, 297 ..	Retford King Bracken
Orphange Clara 7th ..	73300	273	N.C.K.	7,279	5·38	391·7	350	Mature	343, 319, 336	Banyule Silverstone
Springhurst Rochette Tulip	89005	273	N.C.K.	5,644	5·24	295·8	250	Sr. 2	238 ..	Bellefaire Superlative's Pride
Springhurst Sultan Narcissus	89009	150	N.C.K.	1,945	6·80	132·3	250	Sr. 2	153 ..	Springhurst Oxford's Sultan
Springhurst Superlative Narcissus	89010	120	N.C.K.	1,545	5·0	77·2	270	Jr. 3	101 ..	Bellefaire Superlative's Pride
Launder, A. P., Glen Waverly, Jersey (7).										
Beverleybank Lady Pauline	Vol. 32	273	N.C.K.	5,203	5·66	294·4	290	Sr. 3	.. ..	Clifford Farm Repute
Bonco Dairymaid 7th ..	90705	273	N.C.K.	5,330	4·73	252·0	230	Jr. 2	.. ..	Banyule Blonde
Maroola Milkmaid ..	94090	240	N.C.K.	3,120	5·54	172·9	310	Jr. 4	.. ..	Bonnay Edith's Masterpiece
Nenagh Lady Starbright 26th	88177	273	N.C.K.	3,783	6·58	249·0	330	Sr. 4	.. ..	Kyora Adore's Volunteer
Selma Camelia	Vol. 32	273	N.C.K.	4,281	6·16	263·5	330	Sr. 4	.. ..	Glen Iris Golden Voil
Selma Mystic	Vol. 32	273	N.C.K.	5,718	5·86	335·2	330	Sr. 4	.. ..	Glen Iris Golden Voil
Wedgehill Golden Jazz 2nd	79556	273	N.C.K.	4,584	5·16	236·6	350	Mature	.. ..	Wedgehill Ruby's Prince
Lind, A. E., and Sons, Bairnsdale, Jersey (1).										
Sunny Dell Statuette 2nd	Vol. 32	273	34½	6228	5·44	339·1	270	Jr. 3	303 ..	Mornmott War Chief
Linke, H. P., Tarrington, Dairy Shorthorn (2).										
Corresdean Beauty 2nd ..	2424E	273	12	6,612	4·24	275·9	330	Sr. 4	203,228 ..	Drumneil Prince 3rd
Corresdean Princess ..	1794E	273	26½	9,111	3·77	343·4	350	Mature	242, 307,248	Drumneil Prince 3rd
Longerenong Agricultural College, Dooen, Ayrshire (3).										
Longerenong Laurustine 7th	35677	273	N.C.K.	5,438	4·45	241·9	270	Jr. 3	.. ..	Dookie Signet
Longerenong Laurustine 8th	36574	273	N.C.K.	7,393	4·29	317·2	230	Jr. 2	.. ..	Dookie Signet
Longerenong Palm 5th ..	35678	210	N.C.K.	5,557	3·66	203·5	310	Jr. 4	347 ..	Dookie Signet
Macauley, C. W., Rochester, Jersey (3).										
Taramah Flora 12th ..	Vol. 31	273	N.C.K.	3,894	5·37	209·0	250	Sr. 2	260 ..	Cormal Oxford Lad
Taranah Flora 14th ..	C.R.	273	10	3,368	5·91	199·0	250	Sr. 2	288 ..	Five Gum King's Lark
Taranah Floss 10th ..	C.R.	273	N.C.K.	2,970	5·22	155·0	250	Sr. 2	200 ..	Cormal Oxford Lad
Maclean, F. P., Berwick, Jersey (4).										
Navuloa Grandmaster's Harebell	63358	273	N.C.K.	9,213	5·23	481·4	350	Mature	324, 429, 412, 409	Werribee Grandmaster
Navuloa La Harebell ..	73097	273	N.C.K.	4,950	5·48	271·4	350	Mature	348, 363, 387	Staghorn Laburnum's Masterpiece
Navuloa Laburnum's Harebell	78042	273	19½	9,560	5·32	508·8	350	Mature	316 ..	Staghorn Laburnum's Masterpiece
Navuloa Master's Belle ..	88155	273	N.C.K.	7,746	5·26	407·4	250	Sr. 2	316 ..	Navuloa Magnet's Grandmaster

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
McCormack, M. and Sons, Mansfield, Red Poll (9).										
Cypress Bonnie 3rd ..	9222B	273	N.C.K.	5,624	3·90	219·2	250	Sr. 2	.. ..	Bundure Winter
Cypress Cherry Plum ..	6387AA	273	N.C.K.	7,612	3·57	271·4	350	Mature	298, 309, 318, 283	Northwood Prior
Cypress Emery 2nd ..	8871A	273	N.C.K.	5,871	4·10	240·7	250	Sr. 2	.. ..	Bundure Winter
Cypress Honeytime ..	6391AA	273	N.C.K.	7,838	3·63	284·3	350	Mature	298, 295, 265	Northwood Prior
Cypress Honor 2nd ..	9225B	240	N.C.K.	3,840	3·78	145·1	330	Sr. 4	.. ..	Northwood Prior
Cypress Jemimah 2nd ..	8236AA	273	N.C.K.	6,554	4·10	268·7	290	Sr. 3	209 ..	Tatong Honeymoon
Cypress Judith	3110B	273	N.C.K.	9,188	3·34	307·0	350	Mature	356, 424, 279, 318	Woodburn Glennie
Cypress Laura 2nd ..	9251C	273	N.C.K.	6,572	4·19	275·2	290	Sr. 3	160, 236 ..	Burnwood Whistler
Cypress Wild Plum ..	7700A	273	N.C.K.	8,533	3·84	327·5	350	Mature	229, 301 ..	Burnwood Whistler
McKenzie, A. E., Kerang, Jersey (4).										
Pellew Boronia 4th ..	Vol. 33	273	N.C.K.	6,249	5·50	344·0	230	Jr. 2	.. ..	Mundara Ben
Pellew Duchess	83441	273	N.C.K.	7,719	6·30	486·5	330	Sr. 4	.. ..	Pine Ridge Thorn
Pellew Fern's Blossom ..	Vol. 33	273	N.C.K.	4,944	5·77	285·4	230	Jr. 2	.. ..	Mundara Ben
Pellew Ruth	95134	273	N.C.K.	10,616	5·45	579·1	290	Sr. 3	.. ..	Pine Ridge Thorn
McKenzie, Mrs. E. J. and Son's, Woodford, Jersey (3).										
Spring Valley Eremurus ..	83924	273	22½	7,112	4·32	307·4	350	Mature	248, 265, 320, 288	Pine Grove Larkspur King
Spring Valley Vanilla ..	88985	273	..	4,434	5·20	230·5	330	Sr. 4	228 ..	Selsey Gay Prince
Spring Valley Sally 2nd ..	83926	273	14½	5,703	5·66	322·7	350	Mature	245, 225, 289	Selsey Gay Prince
McNabb, G. A. and Son, Irrewillipe East, Jersey (17).										
Avalon Madeira's Pansy 6th	65234	273	N.C.K.	8,487	4·91	416·8	350	Mature	444, 481, 423, 392	Mornmoot Prince Madeira
Maxon Count's Alsyke 9th..	Vol. 31	273	N.C.K.	6,735	6·83	460·3	270	Jr. 3	325 ..	Maxon Handsome Count
Maxon Count's Pet	Vol. 31	273	N.C.K.	4,392	6·32	277·6	270	Jr. 3	296 ..	Maxon Handsome Count
Maxon Count's Pet 2nd ..	Vol. 33	273	N.C.K.	4,280	6·59	282·1	230	Jr. 2	.. ..	Maxon Handsome Count
Maxon D's Clara.. ..	82701	273	N.C.K.	7,241	5·17	374·4	350	Mature	250, 281, 322	Maxon Count's Dawn
Maxon D's Favourite 4th ..	87721	273	N.C.K.	6,324	5·59	353·7	290	Sr. 3	272 ..	Maxon Count's Dawn
Maxon Lady Starbright 2nd	Vol. 33	273	N.C.K.	3,598	6·25	224·7	230	Jr. 2	.. ..	Mornmoot Handsome Count
Maxon Madeira's Daisy 2nd	87727	273	N.C.K.	5,132	5·61	287·7	290	Sr. 3	258 ..	Avalon Prince Madeira 26th
Maxon Madeira's Estelle 2nd	Vol. 33	273	N.C.K.	4,429	5·56	246·4	230	Jr. 2	.. ..	Avalon Prince Madeira 26th
Maxon Madeira's Light 3rd	Vol. 31	273	N.C.K.	6,046	5·38	325·5	270	Jr. 3	312 ..	Avalon Prince Madeira 26th
Maxon Madeira's Light 4th	Vol. 33	273	N.C.K.	5,727	5·04	288·9	230	Jr. 2	.. ..	Avalon Prince Madeira 26th
Maxon Madeira's Pansy ..	..	273	N.C.K.	4,599	4·81	221·1	230	Jr. 2	.. ..	Avalon Prince Madeira 26th
Maxon Noble's Ranunculus 2nd	67854	273	N.C.K.	9,858	5·42	534·5	350	Mature	400, 444, 491, 540, 552	Maxon Duchess's Noble
Maxon S.B's. Alsyke ..	82724	273	N.C.K.	6,036	5·45	329·2	330	Sr. 4	249, 308, 343	Maxon Pansy Starbright
Maxon Silver Light ..	58358	120 (Dry)	N.C.K.	3,075	6·05	186·1	350	Mature	304, 295, 410, 451, 463, 436, 432	Maxon Count's Graceful
Maxon Sweet Estelle ..	54029	273	N.C.K.	6,050	5·27	319·0	350	Mature	285, 397, 326, 488, 455, 386, 341	Maxon Count's Gracfuel
Maxon V.C. Starbright ...	Vol. 33	273	N.C.K.	3,944	5·38	212·2	230	Jr. 2	.. ..	Maxon Handsome Viscount
Maher, R., Tongala, Jersey (2).										
Rosemont Lady Fowler 38th	88812	273	N.C.K.	4,868	6·28	305·8	330	Sr. 4	298 ..	Belgonia Aim High
Rosemont Primrose 14th ..	Vol. 31	273	N.C.K.	7,337	5·19	380·9	290	Sr. 3	307 ..	Belgonia Aim High
Manly, R. A. A., Somerville, Dairy Shorthorn (3).										
The Oaks Mary 2nd ..	C.C.	273	6	4,503	3·21	144·7	250	Sr. 2	.. ..	Hazelwood Emperor
The Oaks Princess 3rd ..	C.C.	273	20	6,030	3·28	197·6	250	Sr. 2	.. ..	Hazelwood Emperor
Weeroona Princess Rosette 2nd	C.E.	273	18	6,618	3·15	208·7	230	Jr. 2	.. ..	Weeroona Royal Prince
Meaklim Bros., Mooroopna, Dairy Shorthorn (1).										
Drumneil Pansy 5th ..	C.C.	273	N.C.K.	9,333	3·36	313·2	230	Jr. 2	.. ..	Drumneil Comet
Mitchell, R. H., Linton, Jersey (7).										
Clifford Farm Estelle ..	Vol. 31	273	29	7,916	5·68	450·0	290	Sr. 3	371, 360 ..	Clifford Farm Sergeant Major
Clifford Farm Gladsome ..	39265	273	17½	5,763	6·29	362·7	350	Mature	454, 718, 602, 527, 549, 408	Clifford Farm Eliminator
Clifford Farm Janice ..	61101	273	25	7,703	4·91	377·9	350	Mature	442, 445, 520, 515, 457	Wompini V.C.
Clifford Farm Ladybird ..	80741	273	21½	7,902	5·21	411·7	350	Mature	387, 388, 469	Clifford Farm Danny Boy
Clifford Farm Lily ..	Vol. 31	273	20½	7,284	5·48	399·3	290	Sr. 3	325 ..	Clifford Farm Leo
Clifford Farm Rita ..	75663	273	16½	6,203	6·36	394·5	350	Mature	482, 459, 508	Clifford Farm Skipper
Clifford Farm Wilma ..	Vol. 33	273	20	6,603	5·65	373·1	230	Jr. 2	.. ..	Clifford Farm Leo

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Moore, J. and Co., Yarram, Jersey (14).										
Avon Dodo ..	70073	273	N.C.K.	3,847	5·05	194·3	350	Mature	413, 503, 430, 176	Ruby's Beau (Imp.)
Avon Dorothy 3rd ..	Vol. 31	240	N.C.K.	3,075	5·55	170·6	310	Jr. 4	183, 91 ..	Avon Bandolier
Clarendon Eyre Camille 11th	56799	273	N.C.K.	4,397	4·12	181·3	350	Mature	298, 336, 477, 289, 279, 417, 284, 226	Victorious Pioneer (Imp.)
Tooloonook Camille 2nd ..	79248	273	N.C.K.	4,541	4·72	214·2	350	Mature	172, 344, 303, 242	Belgonia Lady's Duke
Tooloonook Grace ..	Vol. 33	273	N.C.K.	3,902	4·49	175·2	330	Sr. 4	.. ..	Woodside Columbus
Tooloonook Molly 15th ..	79249	273	N.C.K.	3,543	4·76	168·7	350	Mature	312, 218, 293, 285, 278	Latrobe Musician
Tooloonook Molly 19th ..	79252	240	N.C.K.	2,805	4·19	117·4	350	Mature	197, 466, 295	Belgonia Lady's Duke
Tooloonook Onyx 3rd ..	Vol. 31	273	N.C.K.	4,031	4·67	188·2	270	Jr. 3	151 ..	Belgonia Junette 2nd Design
Tooloonook Peach 12th ..	79254	273	N.C.K.	4,977	5·16	256·8	350	Mature	193, 217, 372, 308, 289	Belgonia Lady's Duke
Tooloonook Peach 27th ..	Vol 33	273	N.C.K.	4,391	4·84	212·5	230	Jr. 2	.. ..	Mornmoot Mornman 3rd
Tooloonook Plumbago 12th	84236	255	N.C.K.	3,248	4·88	158·6	350	Mature	380, 253 ..	Belgonia Lady's Duke
Tooloonook Sainfoin 7th ..	74216	273	N.C.K.	3,788	5·03	190·7	350	Mature	184, 203, 395, 320, 249	Belgonia Lady's Duke
Tooloonook Trixie 40th ..	Vol. 33	273	N.C.K.	4,298	4·48	192·4	250	Sr. 2	.. ..	Mornmoot Mormon 3rd
Tooloonook Verbena 13th..	89320	273	N.C.K.	2,550	4·72	120·4	290	Sr. 3	148 ..	Belgonia Junette 2nd Design
Nicholas, M. A., Sherbrooke, Jersey (3).										
Selsey Great Beauty ..	83874	273	26½	7,525	5·31	399·7	310	Jr. 4	307, 297 ..	Selsey Great Prometheus
Selsey Royal Lily ..	73882	273	30	8,567	4·80	411·3	350	Mature	358, 309, 371, 438	Selsey Right Royal
Selsey Royal Wyandotte 2nd	78884	273	24	6,429	5·26	338·3	350	Mature	313, 245, 424	Selsey Right Royal
Nicholson, N. E., Lang Lang, Illawarra Shorthorn (3).										
Devondale Butterfly ..	C.R.	273	N.C.K.	5,022	3·73	187·4	270	Jr. 3	.. ..	Devondale Guardsman
Veresdale Cherry 2nd ..	33736	273	N.C.K.	7,064	3·20	225·7	350	Mature	284, 212, 291	Ovendale Pearl's Renown
Veresdale Hetty	33741	273	N.C.K.	7,035	3·64	255·8	350	Mature	213, 201 ..	Ovendale Pearl's Renown
Noonan, G., Benalla, Jersey (9).										
Ambyne Golden Maid ..	Vol. 32	273	N.C.K.	3,780	4·96	187·3	230	Jr. 2	.. ..	Carellen Viceroy
Ambyne Leonie	79963	273	N.C.K.	4,111	6·31	259·6	330	Sr. 4	.. ..	Ambyne Leonie's King
Ambyne Mermaid ..	Vol. 33	273	N.C.K.	3,159	5·25	165·9	230	Jr. 2	.. ..	Ripplevale Twylish
Ambyne Sweetbread's Fancy	Vol. 32	273	N.C.K.	3,854	5·12	197·3	230	Jr. 2	.. ..	Carellen Viceroy
Noonavale Aim Fowler ..	Vol. 31	273	N.C.K.	4,988	5·26	262·4	270	Jr. 3	299 ..	Rosemont High Aim
Noonavale Lady Fowler 2nd	Vol. 31	273	N.C.K.	3,787	5·46	206·8	330	Sr. 4	324 ..	Belgonia Perree
Ambyne Fancy Madeira ..	89999	273	N.C.K.	3,971	4·99	198·2	270	Jr. 3	.. ..	Koolarooka Saint's Laddie
Noonavale Silvermine Two	Vol. 31	240	3½	3,330	5·54	184·4	330	Sr. 4	298, 274 ..	Belgonia Perree
Rosemont Silvermine 9th ..	64069	240	3½	4,447	4·99	222·0	350	Mature	293, 306, 502, 476, 311, 273	Rosemont Laddie Fowler 3rd
Parker, L. M., Tallarook, Dairy Shorthorn (5).										
Deep Dale Beauty 3rd ..	2425E	273	N.C.K.	7,026	4·02	282·6	350	Mature	290, 351, 297	Willow Park Barrington 26th
Deep Dale Beryl ..	2426E	273	N.C.K.	9,492	3·76	356·7	350	Mature	275, 316, 330	Willow Park Barrington 26th
Deep Dale Fancy ..	C.C.	273	N.C.K.	5,387	3·38	181·9	250	Sr. 2	.. ..	Willow Park Imperial Cran 34th
Deep Dale Polly 3rd ..	2440E	273	36	11,417	3·72	424·3	350	Mature	279, 415, 457	Willow Park Barrington 26th
Deep Dale Rachel 2nd ..	2441E	273	22	8,901	3·44	306·1	350	Mature	274, 301, 380	Willow Park Barrington 26th
Parkes, E. F., Trafalgar, Jersey (6).										
Irona D.C's. Wendy ..	81899	273	N.C.K.	6,374	6·07	386·7	350	Mature	310, 279, 326, 397	Victoria Dandy Boy
Irona Design's Cobra ..	C.R.	273	N.C.K.	6,182	5·19	321·1	250	Sr. 2	194 ..	Navua Sociable Designer
Irona Designer's Camillia ..	Vol. 32	273	N.C.K.	3,662	6·03	221·0	250	Sr. 2	220 ..	Navua Sociable Designer
Irona Designer's Cowslip ..	Vol. 31	273	N.C.K.	5,915	5·97	353·2	290	Sr. 3	179, 235 ..	Navua Sociable Designer
Irona Sociable Helen ..	Vol. 31	273	N.C.K.	5,416	6·11	331·1	290	Sr. 3	193, 345 ..	Navua Sociable Designer
Irona Wendy's Helen ..	Vol. 32	273	N.C.K.	4,890	5·95	291·1	230	Jr. 2	.. ..	Navua Sociable Designer
Pattison, G., Tongala, Ayrshire (1).										
Willow Park Pearl Queen ..	Vol. 38	273	20	7,356	3·74	275·3	270	Jr. 3	.. ..	Willow Park Hussar

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Payne, A. E. T., Lilydale, Guernsey (5).										
Yarraview Beryl ..	8197	273	30	10,233	5·78	591·3	350	Mature	485, 560, 526, 530, 600, 425, 596	Honoria's Benefactor (Imp.)
Yarraview Faith ..	11962	273	24½	8,928	5·0	446·6	270	Jr. 3	323 ..	Yarraview Sovereign
Yarraview Le Mode ..	8225	273	34½	11,321	6·96	787·5	350	Mature	563, 738, 816, 976, 963	Camilla's Majestic 3rd of Maple Lodge
Yarraview Rougette ..	9788	273	32½	12,339	5·30	654·3	350	Mature	300, 731, 778, 656	Honoria's Benefactor (Imp.)
Yarraview Ruby ..	5178	273	42½	14,856	5·62	835·5	350	Mature	378, 394, 427, 547, 638	Camilla's Majestic of Maple Lodge
Peck, R. A., Catani, Jersey (3).										
Lynbrae Successor's Countess	Vol. 31	273	N.C.K.	5,577	5·29	295·2	230	Jr. 2	.. ..	Belgonia Successor
Lynbrae Waterlily 4th ..	Vol. 31	273	N.C.K.	4,818	5·23	252·1	290	Sr. 3	.. ..	Belgonia Successor
Selsey Wyandotte 6th ..	Vol. 31	273	N.C.K.	6,401	5·84	373·6	310	Jr. 4	.. ..	Selsey Right Royal
Phillips, J. H., Swan Hill, Jersey (1).										
Ryelands Rendova ..	Vol. 33	273	N.C.K.	8,129	5·02	407·9	230	Jr. 2	.. ..	Pine Ridge Stylish
Powell, T. S., Mansfield, Jersey (5).										
Carellen Belle Finese ..	Vol. 33	273	14½	5,984	4·57	273·3	290	Sr. 3	.. ..	Mornmoot Viceroy 2nd
Carellen Golden Cream 4th	85571	273	14½	5,007	4·28	214·3	290	Sr. 3	221, 191 ..	Werribee Planet
Carellen March Melody ..	91079	273	16	5,160	4·89	252·2	230	Jr. 2	.. ..	Shepstone Royal Ensign
Carellen Pretty Maid ..	85576	273	14½	6,227	4·97	309·4	290	Sr. 3	306 ..	Mornmoot Viceroy 2nd
Carellen Stellar Princess 3rd	Vol. 31	273	13	5,005	5·33	266·7	290	Sr. 3	256 ..	Mornmoot Viceroy 2nd
Prince, Mrs. H. A., Swan Hill, Jersey (2).										
Belgonia Buttercup 13th ..	Vol. 33	90 (Dry)	N.C.K.	1,530	5·71	87·3	230	Jr. 2	.. ..	Aim High (Imp.)
Wilda Park Daphne Suspense	Vol. 33	273	N.C.K.	7,134	4·96	353·9	230	Jr. 2	.. ..	Belgonia Premier
Read, Estate of the late J. D., Springhurst, Jersey (17).										
Springhurst Blonde Romeya	55272	240	N.C.K.	4,920	5·36	263·5	350	Mature	377, 399, 523, 463, 526, 555, 284, 412	Bellefaire Seaborn Sucessor
Springhurst Boutillere ..	64270	273	23	7,733	4·42	342·1	350	Mature	336, 424, 458, 490, 394, 325	Glen Iris Anemone's Standard
Springhurst Cuban Lily ..	95788	273	14	4,512	4·56	205·6	230	Jr. 2	.. ..	Twin Oaks Ashley Fern's Noble (Imp.)
Springhurst Doree Narcissus	95795	273	N.C.K.	4,346	5·09	221·0	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Gamboge Narcissus	Vol. 31	273	N.C.K.	4,425	5·27	233·1	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Gamboge Tulip	95795	273	10	4,530	5·51	249·4	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Golden Tulip ..	83938	273	15	6,252	4·45	278·4	310	Jr. 4	260, 328 ..	Springhurst Noble Oak
Springhurst Madeira Narcissus	95795	273	11	5,564	5·01	278·5	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Napoleonette Alsyke	83940	273	N.C.K.	5,114	5·73	293·2	290	Sr. 3	293, 306 ..	Bellefaire Superlative Pride
Springhurst Napoleonette Rommeya	95797	273	12½	4,730	5·10	241·4	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Napoleonette Tulip	89002	273	9	5,118	5·82	298·0	270	Jr. 3	299 ..	Bellefaire Superlative Pride
Springhurst Phillidora's Narcissus	73929	273	18½	6,078	5·30	321·9	350	Mature	343, 434, 345, 344	Twin Oaks Ashley Fern's Noble
Springhurst Rochette Alsyke	95799	273	14	4,436	6·11	271·2	230	Jr. 2	.. ..	Bellefaire Superlative Pride
Springhurst Soeurette Tecoma	78942	273	12	5,172	5·06	261·5	350	Mature	332, 295, 393	Bellefaire Superlative Pride
Springhurst Superlative Lily	83946	273	20½	5,417	5·92	320·6	290	Sr. 3	300, 310 ..	Bellefaire Superlative Pride
Springhurst Superlative Tecoma	83947	273	12	4,536	6·21	281·7	310	Jr. 4	260, 261 ..	Bellefaire Superlative Pride
Springhurst Volunteer's Nardoo	73934	273	22	6,643	5·77	383·3	350	Mature	352, 448, 393, 470	Springhurst Tomatoe's Volunteer
Reid, Estate of the late Miss B. B., Bundoora, Jersey (9).										
Jubilee Auricula	81993	273	5	3,728	5·23	195·1	350	Mature	249, 307 ..	Werribee Stylish Masterpiece
Jubilee Cleome	Vol. 32	210 (Dry)	3	1,530	5·06	77·4	250	Sr. 2	.. ..	Jubilee Timely Light
Jubilee Datura	62340	273	16	6,692	5·07	339·5	350	Mature	297, 321, 190	Werribee Stylish Masterpiece
Jubilee Deeringa ..	Vol. 32	273	13½	4,161	5·02	208·9	250	Sr. 2	.. ..	Jubilee Timely Light
Jubilee Eutoca	81996	273	4	2,340	6·17	144·4	350	Mature	.. ..	Jubilee Richlight
Jubilee Laserwort ..	Vol. 33	273	10	4,093	6·17	252·5	290	Sr. 3	.. ..	Jubilee Lanelight
Jubilee Leontopodium ..	87031	273	10	4,521	5·14	232·3	310	Jr. 4	171, 150 ..	Jubilee Richlight
Jubilee Linseed	Vol. 32	273	8	2,825	5·74	162·2	230	Jr. 2	.. ..	Jubilee Lunerlight
Jubilee Walnut	57878	273	9½	4,366	5·44	237·4	350	Mature	340, 281, 258	Jubilee Whalelight

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire.
Ronalds, O. and Son, Tarago, Jersey (1).										
Jindivick Babs	87011	273	N.C.K.	9,855	5·10	502·8	330	Sr. 4	460, 446 ..	Mornmoot Meteor
Ross, D. M., Croydon, Dairy Shorthorn (4).										
Willow Park Dainty 20th..	2262C	273	27	10,416	3·02	314·8	330	Sr. 4	270 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Damsel 12th ..	1522C	273	12	7,729	3·27	252·9	350	Mature	276, 210, 257	Willow Park Imperial Cran 10th
Willow Park Duchess 54th..	2268C	273	35	9,526	3·93	373·9	330	Sr. 4	261, 329 ..	Anderson Imperial Cran 6th (Imp.)
Willow Park Fairy 13th ..	1680D	273	35	11,683	3·52	411·7	350	Mature	335, 383, 350, 374, 397	Anderson Imperial Cran 6th (Imp.)
Shearman, A. and W., Darnum, Jersey (2).										
Darnum Park Buttercup ..	Vol. 31	273	N.C.K.	8,723	6·03	526·4	350	Mature	129, 562, 518, 462, 432	Darnum Park Minnie's Boy
Darnum Park Starbright's Leonie 4th	C.R.	273	N.C.K.	5,897	5·55	327·0	250	Sr. 2	.. ..	Darnum Park Lord Starbright
Simmons Bros., Lilydale, Jersey (1).										
Woodlands Fuchsia ..	84651	273	N.C.K.	7,940	5·46	433·9	350	Mature	.. ..	Melrose King Jupiter
Smith Bros., Mirboo North, Jersey (4).										
Sylvan Hill Attraction ..	84054	273	N.C.K.	6,459	4·95	319·6	350	Mature	195, 261, 352, 385	Glen Iris Bow Bells
Sylvan Hill Bouquet ..	59600	273	N.C.K.	6,063	7·46	452·6	350	Mature	264, 317, 271, 366, 288, 334, 340, 438	Jerseyholm Handsome Boy 3rd
Sylvan Hill Daisy 4th ..	Vol. 31	273	N.C.K.	5,695	5·03	289·3	250	Sr. 2	168 ..	Werribee Viceroy
Sylvan Hill Trixie 3rd ..	89121	273	N.C.K.	3,926	5·67	222·6	330	Sr. 4	188, 182, 276	Werribee Viceroy
Smith, R. W. and Son, Koo-wee-rup, Friesian (1).										
Wattle Bank Fairy 4th ..	6112	273	16	7,992	2·74	219·3	350	Mature	378, 359, 390, 488, 409, 302	Wattle Bank Segis De Kol
Stephens, Dr. F. G., Vermont, Guernsey (3).										
Bungalow Vale Fairy ..	3975	273	24½	7,691	4·88	375·7	350	Mature	332, 356, 341, 408, 443, 404, 388, 429, 446	Melbourne Sequel Slogan
Vermont Annie	11743	273	15	5,962	5·04	300·2	270	Jr. 3	251 ..	Vermont Camilla's Sunrise
Vermont Flossie	11745	273	22	7,161	5·08	363·9	290	Sr. 3	316 ..	Vermont Camilla's Sunrise
Syme, D., Woori Yallock, Guernsey (1).										
Meadow Vale Briar ..	10873	273	N.C.K.	5,816	4·77	277·2	290	Sr. 3	188 ..	Meadow Vale Marquis
Tait, W. G., Dreeite, Jersey (9).										
Glen Valley Silver Beauty..	71548	273	N.C.K.	5,072	5·85	296·5	350	Mature	376, 331 ..	Brucevale Wyandotte's King
Lara Pansy 15th.. ..	82352	273	11¼	4,972	5·04	250·8	330	Sr. 4	314, 354, 301	Avalon Prince Madeira 8th
Stonybank Belladonna ..	73956	273	16	7,041	4·69	330·3	350	Mature	321, 435, 381, 279	Design's Golden Oxford (Imp.)
Stonybank Belladonna 4th..	83975	273	N.C.K.	5,745	5·26	302·4	290	Sr. 3	366, 309 ..	Mornmoot War Ward
Stonybank Belladonna 5th..	95835	273	N.C.K.	3,330	5·42	180·4	230	Jr. 2	.. ..	Stonybank Madeira's King
Stonybank Gaiety Girl 14th	83977	273	N.C.K.	5,569	5·01	278·9	290	Sr. 3	311, 281 ..	Mornmoot War Ward
Stonybank Snowdrop 10th..	89032	273	N.C.K.	5,933	5·55	329·0	250	Sr. 2	328 ..	Mornmoot War Ward
Stonybank Snowdrop 11th..	95839	273	N.C.K.	4,925	4·46	219·8	230	Jr. 2	.. ..	Stonybank Madeira's King
Stonybank Snowdrop 12th..	95840	273	N.C.K.	4,723	4·98	235·4	230	Jr. 2	.. ..	Stonybank Madeira's King
Tandberg, G. and Son, Warragul, Illawarra Shorthorn (3).										
Bodalla Fiancee	Vol. 10	273	N.C.K.	7,463	3·79	282·6	350	Mature	358 ..	Berry Pride
Veresdale Peach	28356	273	N.C.K.	6,245	3·55	221·8	350	Mature	334, 403, 301, 304	Ovensdale Pearl's Renown
Veresdale Royal	Vol. 8	273	N.C.K.	8,545	3·43	293·2	350	Mature	254, 254 ..	Numbawarra Maiden's Sultan
Till, J. A., Tongala, Jersey (4).										
Anfield Morocco Pansy ..	79975	240	N.C.K.	9,067	4·11	372·9	350	Mature	.. ..	Anfield Mite's Chief
Hurarie Design	92040	273	N.C.K.	7,106	5·83	414·4	230	Jr. 2	.. ..	Belgonia Design's Combination
Eurarie Morocco Rose ..	92044	273	N.C.K.	7,104	4·52	320·8	230	Jr. 2	.. ..	Grangelea Roderick 3rd
Hurarie Princess 3rd ..	92045	273	N.C.K.	8,081	5·31	429·3	230	Jr. 2	.. ..	Grangelea Bell Boy

Name of Cow.	Herd Book No.	No. of Days in Test.	Milk Last Day of Test. lb.	Milk. lb.	Average Test.	Butter Fat. lb.	Standard Required.	Class.	Previous Yields of Butter Fat.	Sire
Tomasetti, B. G., Drouin, Ayrshire (3).										
Emoh Ruo Angie ..	36267	273	N.C.K.	9,540	3·82	364·1	350	Mature	296, 266, 295	Emoh Ruo Excellent
Glencorren Fine Quality ..	36314	273	N.C.K.	8,937	4·59	410·5	330	Sr. 4	322, 281 ..	Glencorren Peerie
Glencorren Greta.. ..	35440	273	N.C.K.	11,736	4·4	516·7	330	Sr. 4	315, 410 ..	Glencorren Future
Trevaskis, F. T., Tongala, Jersey (2).										
Ballara Beauty	Vol. 31	273	N.C.K.	5,773	4·62	266·7	250	Sr. 2	230 ..	Werribee Madeira's Ace
Ballara Model 21st ..	85019	273	N.C.K.	9,198	5·07	466·5	310	Jr. 4	338 ..	Werribee Madeira's Ace
Trewin, J. V., Nathalia, Jersey (2).										
Weir View Northern Princess 2nd	74482	273	23½	7,215	4·58	330·3	350	Mature	250 ..	Carellen Northern Duke
Weir View Wattle ..	89544	273	N.C.K.	8,042	4·51	363·0	270	Jr. 3	.. ..	Ballara Ideal's Ace
Turner, A. J., Yannathan, Jersey (4).										
Fontenay Goldie	Vol. 31	273	N.C.K.	3,799	5·51	209·3	250	Sr. 2	221 ..	Selsey Designer
Fontenoy Lotus	C.R.	273	N.C.K.	2,252	5·09	114·7	230	Jr. 2	.. ..	Selsey Designer
Fontenay Rosette ..	92148	273	N.C.K.	5,614	5·58	313·4	250	Sr. 2	.. ..	Selsey Designer
King's Vale Lady Monica 71st	87211	273	N.C.K.	4,380	5·30	232·3	290	Sr. 3	.. ..	King's Vale Bradman
Tyssen, C. J., Warragul, Jersey (6).										
Hylsbroke Bonnie Dinah ..	Vol. 33	273	..	4,831	4·75	229·3	250	Sr. 2	.. ..	The Wattles Young Gamboge
Hylsbroke Jolly Lassie 11th	86854	255	N.C.K.	4,223	4·81	203·3	290	Sr. 3	327 ..	The Wattles Young Gamboge
Hylsbroke Joystep 12th ..	Vol. 31	210	N.C.K;	3,705	4·87	180·4	270	Jr. 3	183 ..	The Wattles Young Gamboge
Hylsbroke Larkspur 5th ..	Vol. 31	273	N.C.K.	3,335	5·42	181·6	250	Sr. 2	242 ..	The Wattle's Young Gamboge
Hylsbroke Larkspur 6th ..	Vol. 33	240	N.C.K.	2,565	6·11	156·8	230	Jr. 2	.. ..	Ballara Grandmaster
Hylsbroke Marina 4th ..	Vol. 33	273	N.C.K.	6,500	4·80	311·7	230	Jr. 2	.. ..	Ballara Grandmaster
Vaughan Bros., Girgarre, Jersey (1).										
Lynroy Venetta	Vol. 31	273	N.C.K.	4,851	5·59	271·2	270	Jr. 3	400 ..	Lynroy Pixies Prince
Wade, G. F., Stratford, Jersey (4).										
Inverbroom Air Viola ..	81875	273	N.C.K.	7,143	6·66	475·7	330	Sr. 4	297, 345 ..	Banyule Airport
Inverbroom Eminent's Empress	86891	273	N.C.K.	7,636	6·0	457·8	310	Jr. 4	287, 351 ..	Clarendon Eyre Eminent's Boomerang 4th
Inverbroom Silvermine ..	Vol. 33	273	N.C.K.	5,784	4·95	286·1	230	Jr. 2	.. ..	Ismalia Socks
Pine Lodge Bright Star ..	C.R.	273	N.C.K.	8,291	5·22	432·7	270	Jr. 3	258 ..	Melrose Island King
Waterhouse, H. W. and Son, Pakenham, Jersey (3).										
Ovalau Chocolate Cream ..	88383	273	20	8,747	5·68	496·4	310	Jr. 4	361, 461 ..	Ovalau Magnet's King
Ovalau Magnite	Vol. 31	273	23	8,356	6·08	507·8	290	Sr. 3	488 ..	Ovalau Magnet's King
Ovalau Planets Laburnum..	Vol. 33	273	15½	5,837	5·32	310·8	230	Jr. 2	.. ..	Werribee Planet
Williams, Les., Bamawm Extension, Jersey (3).										
Bamawm Bonnie Madeira..	Vol. 31	273	N.C.K.	9,075	6·47	586·9	290	Jr. 3	380 ..	Mornmoot War Hero
Blythwood Queen 3rd ..	90653	273	N.C.K.	6,792	5·50	373·7	230	Jr. 2	.. ..	Glen Iris Royal Gallant
Warwich True Love 4th ..	Vol. 31	273	N.C.K.	7,502	5·0	374·9	270	Jr. 3	241 ..	Selsey Design's Foremost
Williams, Estate of the late F. A., Bamawm Extension, Jersey (1).										
Bamawm Lady Prim ..	90350	273	N.C.K.	4,093	6·08	248·9	230	Jr. 2	.. ..	Bamawm Lady's Hero
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Lough View Rosebloom 5th	C.R.	120	N.C.K.	1,455	4·43	64·5	250	Sr. 2	.. ..	Lough View Hurricane

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DAIRYING INDUSTRY THREATENED

Every Heifer Calf Is Needed

By A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

Dairy cattle numbers—lower now than they have been for more than twelve years—are still declining and unless dairy farmers do something to stop the rot and rear many more heifer calves than they have done during the past few years, they will drive themselves out of business. The industry cannot thrive on old or diseased animals ; young healthy cows are urgently needed to replace ageing, unproductive stock and to restore herds to former strength.

DURING the war, dairy farmers were faced with labour and feed shortages, and, in their efforts to carry on, reared fewer and fewer calves. Then came the drought, and, even with depleted herds, farmers found themselves over-stocked and had to sell large numbers in an attempt to save the remainder. Unfortunately, the young stock suffered most during the drought. Owners of house cows, unable to buy feed, had to sell their animals, and as these owners usually rear all their heifer calves and rear them well, the loss of these cows has been a severe blow to the industry.

There are now ample resources of fodder, a good season is assured and with a grave shortage of all other classes of farm live-stock, every heifer-calf born can be reared without any danger of over-stocking.

The very high prices at which dairy cattle are selling indicate that the demand greatly exceeds the supply. This demand is likely to be accentuated by the requirements for soldier settlement. The Soldier Settlement Commission has decided that, subject to the cattle being approved by the purchasing officer of the Commission, a minimum price of £5 per head will be paid for well-reared heifers of average quality at the age of from five to seven months. Higher prices may be paid where special quality is shown. Springing heifers are now selling at prices which allow from £8 to £12 clear profit over rearing costs.

Two and a half years ago, the Department of Agriculture urged dairy farmers to rear 400,000 heifer-calves during 1944 and another 400,000 during 1945. Largely

because of the drought, not more than 200,000 heifers were reared during each of those years. Today there are far less cows from which to get calves and the highest number that can be asked for is 350,000 heifers this year and a similar number next year. *To achieve this goal, every healthy heifer calf must be reared from now on.*

Early Calves Do Best

Early calves always do best. They can be weaned before the pastures dry off in early summer and mated to calve early as two-year-olds. Therefore, no healthy heifer calves should be destroyed or sold for slaughter at this time of year.

A little dry feed after the bucket prevents ear-sucking and aids growth.

The best calves are always reared in relatively small numbers on individual farms, although the writer has had 65 calves on the bucket at the one time and they did well. Few farmers would have more than this number on the one farm at the one time. The rearing of calves from birth onwards in very large numbers, at centres specially provided for the purpose, has not proved satisfactory in other Australian States and in those parts of the world where it has been tried. *Under present methods, calf rearing is an individual job for every dairy farmer. It is an integral part of dairy farming, and in rearing every heifer calf, dairy farmers will be safeguarding their own interests.*

Points To Remember In Calf Rearing

1. See that the new calf gets a good feed from its mother before being removed to the calf pen.

2. Keep the calf pens clean, dry, and free from draughts.

3. Ensure that the calf receives the correct amount of milk or milk-substitute regularly twice-a-day, particularly during the first two weeks, until it is able to forage for itself.

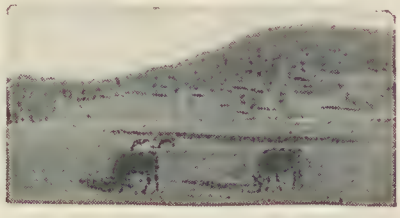
4. Run calves on clean, sheltered pastures early.

5. Rotationally graze the calf paddocks, of which at least three are desirable if the herd is large. Each paddock may then be grazed continuously for ten days and rested for twenty days.

6. Do not graze other cattle in the calf paddocks, as calves readily pick up most ailments from older stock.

7. Feed some good quality hay or chaff.

8. Wean the calves on to good feed when they are old and big enough to fend for themselves.



CHEMICAL AND ORGANIC MANURES IN VICTORIAN AGRICULTURE

By H. C. FORSTER, Ph.D., M.Agr.Sc., *Assistant Chief Inspector of Agriculture*

In recent years the use of so-called "artificial" or chemical fertilizers has been subjected to much criticism by supporters of the "compost" school, who claim that healthy plants can be grown only on soils which have received specially prepared organic manure, and to which no chemical manure such as superphosphate has been added. From a study of the figures given in this article however, it will be evident that broad generalizations cannot be made to cover all manurial practices, even over a small State such as Victoria, much less over conditions in various parts of the world. Where one soil or one crop may need organic manure, another may need one type or other of chemical fertilizer, while yet another will need both forms of manure for its best growth. Only by conducting many and varied experimental tests over a period of years, and by studying the economic as well as the practical considerations of the different manurial treatments, can we hope to be able to say what is the best. The only effective answer to questions of this nature lies in the results obtained from long-term field experiments in which the various manurial treatments can be judged one against the other in their effect on plant development and yield.

IN their authoritative article "Balanced Manuring", published in the *Scottish Journal of Agriculture* for January, 1945, Dr. W. G. Ogg, Director of the Rothamsted Experiment Station, and Dr. Hugh Nicol, of of the Imperial Bureau of Soil Science state that "Most of the opponents of fertilizers allege that fertilizers poison the soil, bring about erosion, injure the quality of crops and lower the ability of plants to resist disease. Further they hold that animals and human beings consuming these crops are particularly susceptible to many diseases". In answer to this view Dr. Ogg points out that "most of the ills of soils, plants and animals which they cite, existed before fertilizers were discovered, and are rife where fertilizers have not been used. Malnutrition is no new trouble and soil erosion was a problem to George Washington and his hardly less famous and equally enterprising successor, Thomas Jefferson".

Trials at the Rothamsted Experiment Station have shown that, as far as England is concerned, each of these two types of manure has a place in maintaining fertility of the soil and in increasing yields of agricultural crops.

Drs. Ogg and Nicol continue: "There are still many gaps in our knowledge of soils and plant nutrition, but the problems are complex. At Rothamsted, some of the classical experiments have been carried on for periods ranging up to a century. Although not designed on modern lines, they have provided, and continue to provide, much valuable information about the relative value of nutrients in organic manures and inorganic fertilizers in increasing yields and about their effects on the soil, on crops and on crop pests. A vast amount of work dealing with the effects of fertilizers with and without organic manures has also been done at many centres in this country and throughout the world. The conclusions are, therefore, not based on the investigations of any single institution".

In view of the recent criticisms expressed by members of the "compost" societies in this country, it may be well to review for a moment the results of a few of the trials on the use of both organic and chemical manures in Victoria.

CHEMICAL MANURES

Of the chemical fertilizers used in Australia, superphosphate by far exceeds all other forms of manure and much of the criticism has, therefore, been directed against it. The use of this fertilizer has indeed become so general amongst farmers, and is so much a part of normal practice, that its importance is not always given due recognition, and it is only when a major shortage occurs such as resulted after Japan attacked Nauru and Ocean Islands that its real value is appreciated by the community.

It is for the purpose of supplying accurate figures on this question that the Victorian Department of Agriculture has carried out carefully conducted, long-term permanent trials in which certain plots have never been treated with manures in contrast with others treated with various combinations of different fertilizers.

Cereals—Superphosphate Plays the Major Part

The results of the tests on wheat conducted since 1912 at the State Research Farm, Werribee, are given in Table 1 and are characteristic of similar results obtained in other Victorian districts.

TABLE 1.—PERMANENT MANURIAL TRIAL, WERRIBEE.

Average Yields of Wheat (1913–45).

	Bus./ac.	Flag Smut (1928–29).	Soil pH.
		%	
No Manure	6·4	3·3	5·5
Super. 1 cwt./ac. ..	16·5	3·3	6·0
Super. 2 cwt./ac. ..	19·4	1·9	5·6
Farmyard Manure 10 tons/ac.	15·1	13·4	6·0

The figures in Table 1 demonstrate beyond question that land sown to wheat for a number of years without manure gives very poor yields. The plants now grown on the "no manure" plot at Werribee are very small, stunted and dark bronze in colour, with very few tillers per plant and generally are most unhealthy in appearance. Yields from the "supered" plots show marked increases over the "no manure" plot and the plants have a healthy green colour and are much more vigorous in growth.

Further, it is apparent from the Table that the yield from the "farmyard manure" plot to which applications at the heavy rate of 10 tons per acre are given, is less than that from the "1 cwt. super per acre",

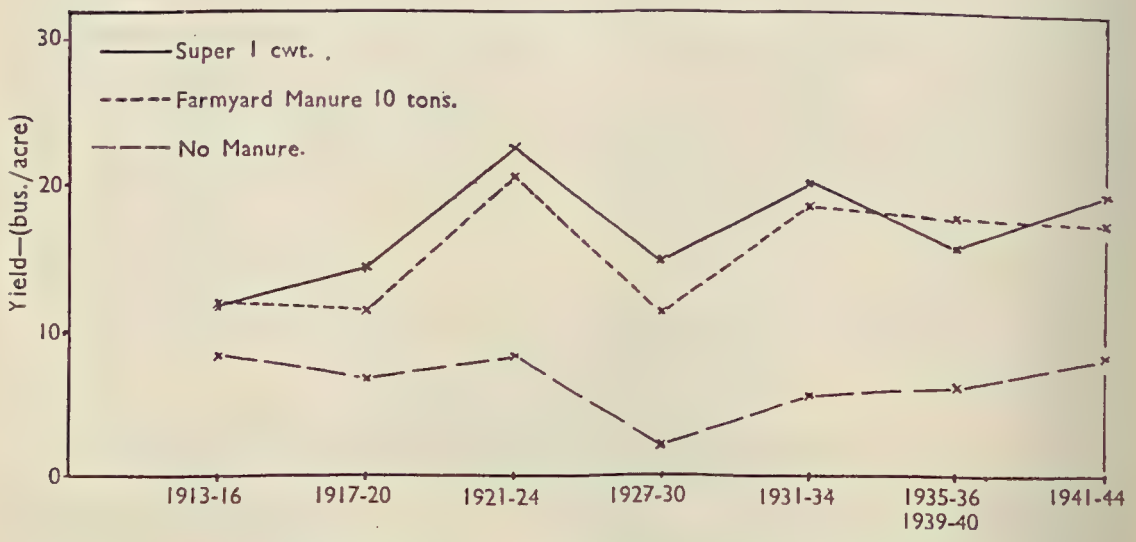


Fig. 1. Permanent Manurial Trial, Werribee. Trend of Average 4-year results, 1913-1944. (1925-26; 1937-38 omitted—residual test conducted in those years.)

and is well below the "super 2 cwt." p.a. plot. Organic manure, therefore, does not produce as good a result in increasing the yield of wheat on the Werribee plots as superphosphate.

In regard to resistance to disease which is claimed by the "compost" school to be characteristic of plants grown on plots treated with organic manure, it is interesting to note that in the observations taken on flag smut, a disease of wheat, the "farmyard manure" plot showed 13·4 per cent. of flag smut compared with 3·3 per cent. on the "1 cwt. super" and 3·3 per cent. on the "no manure" plots. Organic fertilizers have, therefore, in this case at any rate resulted in a material increase in disease, whereas the chemical fertilizer has not caused any such increase.

Fertilizer trial on potatoes at Fish Creek.
Left—No manure. Right—6 cwt. super. + 1 cwt. amm. sulphate.

It is also frequently stated that the continued use of superphosphate makes the soil "acid" and so destroys the fertility of the soil. The figures for the pH of the various plots in this trial, as shown in Table 1, give no indication that, at Werribee, the superphosphate has had any tendency to produce acidity.

The claim has also been put forward that the use of chemical manures will result in a decrease of fertility whilst organic manures will build up and improve the soil. Figure 1 shows the three-year average yields since 1913 of the plots in question. The marked variation in yields, which is due to seasonal effects, somewhat obscures the general trend, but there is no indication over the past 33 years of any difference in the soil fertility as measured by yield between plots receiving "farmyard manure" and those receiving "superphosphate".

There is no evidence, therefore, to show that over a 33-year period applications of farmyard manure at the rate of 10 tons per acre to a cereal grain crop such as wheat, will result in as high a yield as will the application of 1 cwt. of superphosphate per acre. When the economic considerations of the cost of applying farmyard manure and difficulty of obtaining the requisite amount to apply to a normal wheat farm are borne in mind, and compared with the relatively simple and cheap method of applying superphosphate with the seed as practised at present, no sane individual could do other than advocate the use of chemical manures in preference to farmyard manure.

Equally convincing is the evidence from experimental trials with superphosphate on other forms of cereals, such as oats and barley and with many other crops.

Potatoes

The results with potatoes at Beech Forest for instance show that with the use of 6 cwt. of superphosphate, yields have been increased by more than 2 tons per acre of potatoes over a 10-year period. When an additional 1 cwt. per acre of ammonium sulphate is added the yield has been still further increased by 33 cwt. per acre.

TABLE 2.—FERTILIZER TRIALS, POTATOES.

—	Average Yields (10 Years).
Beech Forest.	
No manure	78 cwt. p.a.
Super. 6 cwt. per acre	120 ,,
Super. 6 cwt. + Am. Sulph. 1 cwt.	153 ,,
Trentham.	
No manure	72 cwt. p.a.
Super. 3 cwt. per acre	105 ,,
Super. 3 cwt. + Am. Sulph. 1 cwt.	125 ,,

Superphosphate Fundamental to Imported Pasture Species

Remarkable progress in pasture improvement has been made in Victoria in the last 30 years, and this has been effected mainly by topdressing with superphosphate. The complete absence of any clover species in the evolution of native pastures in this country, and the failure of imported clover strains to establish themselves when sown without manure, placed our pastures in an unfavorable position compared with those overseas. The story of the spread of the pioneer subterranean clover over six million acres of Victoria, and the subsequent raising of the fertility and the carrying capacity of much of the land from an average of one dry sheep per acre, to two and three sheep per acre, is one of the major achievements of agricultural development in this State. Some of the earliest topdressed plots are still being conducted at Rutherglen. Tests were made there in 1912, followed by others at various other places in succeeding years, and now, with the aid of the Victorian Pasture Improvement League, comprehensive tests are conducted throughout the higher rainfall areas of the State. The results from trials conducted at the Experiment Farm, Rutherglen, as shown in Table 3, illustrate the increased carrying capacity following on topdressing of natural pastures with superphosphate.

TABLE 3.—SHEEP GRAZING TRIALS, EXPERIMENT FARM, RUTHERGLEN.

Average Results of Pasture Top-dressing Tests on Natural Pastures for Seventeen Years, 1920 to 1936.

	Plot 2, Super. 1 cwt. per Acre. Sheep Carried.	Plot 3, No Manure. Sheep Carried.
	per acre	per acre
Average for seventeen years (1920–36)	2·0	1·2
Average for eleven years (1926–36)	2·5	1·6
Ewes and 100 per cent. lambs (1938–42) ..	1·9	1·1
Average live weight of lambs (1938–42)	73·2	67·0

Plots are each 3¾ acres in area. Manure was applied in the autumn of 1914 to 1920 and then in 1924, 1928, 1932, 1936, 1938, 1940, and 1942.

All these tests show the fundamental importance of superphosphate in pasture improvement and they show also that the benefits are sustained.

The increased population of live stock in this State is undoubtedly related in part to this improvement in pastures and production figures have increased accordingly. The number of dairy cows in 1922 (720,000) had increased to 960,000 in 1942, and the value of dairy products had doubled in that period. Fat lamb production also has advanced and lamb carcass exports have multiplied.

The effect of super. applied at the rate of 2 cwt. per acre is clearly shown in this picture.

Fertilizer trial on Williams' pears in the Goulburn Valley. Prunings from 6-tree plots are shown: Top, no fertilizer ; left, 5 lb. " complete " fertilizer per tree (4 parts sulphate of ammonia, 4 parts superphosphate, 1 part potash) ; right, 5 lb. nitrate of soda per tree.

In quantitative tests with superphosphate based on yields of herbage it is repeatedly shown that yields are doubled, growth is better distributed, winter feed is augmented and, what is of greatest importance, the quality of the pasture is improved mainly by the development of clovers and associated plants, which are themselves important agents in soil fertility regeneration. All these benefits are integrated in the progress of live stock and their products, which are mainly the derivatives of pasture.

It is on irrigated pasture lands particularly that the benefits of superphosphate are displayed. Experimental evidence in the past showed the superiority of superphosphate for top-dressing lucerne. When mixed introduced pasture species became more popular in irrigated areas, extended use of superphosphate was essential to their full development.

Results of quantitative tests on yields of herbage at the State Research Farm, Werribee, are shown in Table 4.

TABLE 4.—IRRIGATED PASTURE MOWING TESTS—STATE RESEARCH FARM, WERRIBEE.

Summary of Yields—Manurial Test Plots—1929–30.

(Fertilizers applied annually from 1925 onward.)

Plot No.	Total Yield of Green Grass (80 per cent. Moisture).
	lb.
1. No manure	1,480·5
2. Super. 1 cwt. per acre	2,298·5
3. Super. 2 cwt. per acre	2,798·5
4. Super. 3 cwt. per acre	3,306·0
5. Super. 4 cwt. per acre	3,600·0
6. No manure	1,766·0

Area of Plot = 1/20th acre approx.

Chemical analysis shows that pasture from the topdressed plots is of greater nutritional value than pasture from plots that have not been topdressed, and graziers who have, on occasions, applied superphosphate to portions of a paddock only, well know the preference of their stock for the more nutritious topdressed pasture.

A green crop of Blue Lupins in a young lemon grove.

Soil Analyses

The reasons underlying these remarkable responses of Victorian crops and pastures to applications of superphosphate are not hard to find when a study of the mineral composition of the soil is made. E. J. Russell points out in "Soil Conditions and Plant Growth" that in Britain, P_2O_5 content ranges from ·15 to ·2 per cent. in good loams while sandy loams contain about ·1 per cent. Under Victorian conditions, even the better quality loams seldom exceed ·12 per cent., while sandy loams usually contain less than ·06 per cent. When available P_2O_5 is considered, a similar position is revealed as discussed by Howell in "Soil Problems in Wheat Growing".

Horticultural Crops—Nitrogenous Manures

The response to applications of superphosphate, however, is not invariably favorable even in Victoria, which shows such marked deficiency of phosphate in its soil. The type of crop and the conditions under which it is grown also play an important part. For instance, as far as horticultural crops are concerned, the evidence on the effect of superphosphate added to tree and vine fruits gives no indication of a favorable response. Increased yields in the case of this type of crop are given when nitrogenous manures such as ammonium sulphate or nitrate of soda are applied. The yield figures for tests with citrus in the Mildura area as shown in Table 5 are typical.

TABLE 5.—CITRUS FERTILIZER TRIAL—MERBEIN.

	Average Yields (4 Years).
No manure	317 lb. per tree
Am. Sulph. 8 lb. per tree ..	441 ,,
Am. Sulph. 8 lb. Super. 8 lb. Potash 8 lb. } per tree ..	441 ,,

So also in the case of such summer crops as maize, sugar beet, and tobacco, we find that increased yields are obtained with nitrogenous rather than phosphatic manures, although in the latter cases such treatment may affect the characteristics of the product. If agricultural scientists, in their first experiments had tested only this class of crop and then broadcast the conclusion that phosphates were not required for Victorian soils, what a disaster that would have been for the State as a whole!

Although not so common nor widespread, examples could also be quoted where deficiencies of potash and other chemicals exist in Victorian soils, and, in these cases, similar responses have been obtained from applications of the deficient chemical.

Minor Elements

Certain areas, occurring more particularly in South and Western Australia, and to a lesser extent in Victoria, also suffer from deficiency of so-called minor or trace elements such as copper, cobalt, zinc, and molybdenum. These districts constitute striking examples of soils which need chemical manures. Pastures in these areas are often almost non-existent and in some instances stock will not develop nor mature unless taken periodically to "healthy" country. The position is changed in a remarkable manner merely by the addition of a few pounds of a chemical containing the given trace element, pastures showing vigorous growth and stock maturing normally.

These are a few of the results which show the importance and value of chemical fertilizers to this State. There can be no question that without their use agriculture could not have developed to the degree that it has, nor could this country have made the contribution it did in maintaining the food supplies necessary for the armed forces and for export to England in the past five years.

ORGANIC MANURES

No agricultural scientist, however, would advocate that chemical manures alone are sufficient to maintain the fertility of our soils. The importance of the organic humus content in improving soil texture, in making plant foods more available, in encouraging bacterial life, and in the retention of moisture, has been recognized for many years and increasing attention is being given to this aspect.

It is generally recognized that organic matter may be added to the soil of cultivated areas in three main ways :—

(*a*) by the direct addition of decayed vegetable and animal refuse in a manner similar to that advocated by the "compost" school.

(*b*) by the ploughing-in of green crops.

(*c*) by the modification of a given rotational system such as wheat–fallow–wheat, to include two or more years of pasture which may then be grazed by sheep or cattle.

The best method in any particular case varies with the type of crop, the class of soil and the climate of the locality.

The direct addition of organic matter to the soil has a limited application in this country. As the previous figures show, the Werribee trials indicate that for cereals, farmyard manure, even at the heavy rate of 10 tons per acre cannot increase yields of wheat as much as the use of 1 cwt. of superphosphate per acre.

Organic Manures have a place in Vegetable Production

With other types of production, however, such as market-garden crops, where vegetative growth is more vital and soils are generally more sandy in nature, stable manure has been most beneficial. In the light sandy soils normally occurring near Melbourne, observation has shown that when stable manure is not used, the soils fail to absorb and hold sufficient moisture to mature the crops satisfactorily. When carried to extremes, the soil rapidly develops signs of becoming deficient in many plant nutrients. For these types of soils, the Department of Agriculture advocates farmers to use up to 10 tons of stable manure per acre.

Green Manure Cropping

The ploughing-in of green manure crops, which forms an alternative method of adding organic matter, is more applicable to larger areas than the use of farmyard manure or compost and is often used with profit overseas.

The Department of Agriculture has also investigated this aspect of organic manuring and while it has been proved beneficial for some crops, it has not been of value to others. For instance, as far as cereals are concerned, tests to date have not given any indication that, over a period of years, green manuring is of benefit.

The results from the Green Manurial Trials (Table 6) at Werribee are typical of results obtained elsewhere in the State, and show that no benefit has been obtained with certain cereals when green crops have been ploughed into the soil.

On the other hand with potatoes, observations show that at Millbrook, over a period of years, not only were the yields increased by the ploughing-in of green crops

but the general free tilth of the soil was improved with the subsequent effect of improving the shape and grade of potatoes grown.

TABLE 6.—GREEN MANURIAL TESTS—WHEAT YIELDS.

Average Results (21 Years)—Werribee.

Rotation.	Average Yield per Acre.
	bushels
Wheat after fallow	20·7
Wheat after Rape ploughed in ..	19·7
Wheat after Peas ploughed in ..	21·5
Wheat after Oats ploughed in ..	17·5

Further it has been shown that green manuring between vines in particular is essential if production is to be maintained at a high level. Results of a similar nature are also obtained with citrus and other tree fruits and the practice of the ploughing-in of green crops is generally adopted by horticulturalists in those areas.

Clover-Ley Improves Fertility of the Soil

Recent work by the Department of Agriculture is opening up a new angle on the maintenance of the fertility on our broad-scale cultivation areas. Although the overseas practices of farmyard manuring and the ploughing-in of green crops have not resulted in increased yields of cereals in Victoria, recent work on the Experimental Farms has shown that when the rotational system of wheat–fallow or wheat–oats–fallow is broadened to include a year or two of grazing, the following cereal crop is improved in yield.

In the moister cereal districts it has been found best to sow subterranean clover with the last cereal crop and to graze this for two or more years, while in the drier districts, the most practical way to introduce the grazing appears to be by the sowing of oats for grazing.

The results from trials at the Rutherglen Experiment Farm give ample evidence of the value of the inclusion of the grazing animal in the rotation in preference to the ploughing-in of green crops or to the application of farmyard manure.

TABLE 7.—RUTHERGLEN EXPERIMENT FARM —WHEAT YIELDS.

Soil Fertility Test.	Average Yield of Wheat (1938–39).
Fallow on old cultivation land (Super. 1 cwt.)	14·1 bus. p.a.
Fallow after volunteer ley (Super. 1 cwt.)	19·6 ,,
Fallow after clover ley (Super. 1 cwt.)	24·3 ,,

Green Manurial Test.	Average Yield of Wheat.
Wheat after fallow (Super. 1 cwt.)	18·7 bus. p.a.
Wheat after peas ploughed in (Super. 1 cwt.)	16·8 ,,

Permanent Manurial Trial.	Average Yield of Wheat (20 Years).
Farmyard manure 10 tons per acre	20·3 bus. p.a.
Super. 1 cwt. per acre	21·2 ,,
Super. 2 cwt. per acre	22·2 ,,

Further investigations are in progress to determine the precise reason for this improvement in the fertility of the soil, and why the addition of decayed organic matter or the ploughing-in of green crops does not produce the same result. It may well be that a closer study of the relationship between the plant and the bacterial flora of the soil will give the explanation, and that, for their healthy development, both plants and bacteria should be associated with the animal.

BOTH ORGANIC AND CHEMICAL MANURES HAVE A PLACE IN AGRICULTURE

As our knowledge of plant growth is widened, it becomes increasingly evident that the plant cannot develop to its fullest degree without both organic and chemical manures being available to it. Not only must the organic humus content

[*Continued on page 313*

Maffra and District

Irrigated Pasture and Lucerne Competitions

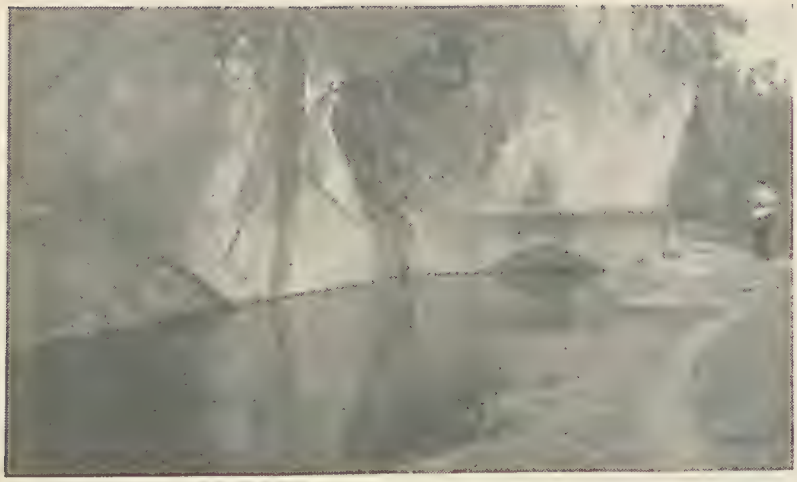
1945-46

Report of the Judge, G. B. RAYNER, B.Agr.Sc.,
Irrigation Research Officer

Glenmaggie Weir, water storage for the Maffra Irrigation District.

THE Maffra and District Agricultural Society is to be congratulated upon its efforts to foster local interest in better farming methods by continuing to conduct annual competitions for proficiency in various branches of irrigated farming practice. This year competitions were held for the use and control of irrigation water on the farm, irrigated pastures, and irrigated lucerne. The last two are the subject of this report. The State Rivers and Water Supply Commission indicated its recognition of the value of these competitions, by again offering appropriate prizes of free irrigation water; and the co-operation of the officers of the Commission stationed at Maffra in providing transport, arranging an itinerary, and advising the competitiors accordingly, greatly facilitated the task of the judge.

Fourteen entries were received in each section of the irrigated pasture and lucerne competitions, from which it would be justifiable to conclude that the interest of the farming community in these contests is being maintained. However, when consideration is given to the total number of farms in the area, and to the fact that many of the same competitors enter in successive years, it will be seen that a relatively small proportion of district farmers is involved, and the suggestion is made that a wider interest may be created by some variation in the type of competition. For example, the provision of excellent shelter belts is a



North channel at entrance to No. 1 tunnel. This channel supplies the whole of the irrigation area on the north side of the Macalister River, except the Tinamba area.

feature of some farms in the district, and a competition in which this aspect of farming practice occupied a prominent place may help to stimulate interest in tree planting and the use of trees generally on the farm. As the proposed extension of the district takes place and more land is brought under irrigation, a grading contest would not be out of place.

Many of the crops of lucerne entered in the 1945–46 competition were on unirrigated land, which rendered them ineligible for a prize. Lucerne grows to perfection without irrigation in many parts of the district, and a number of the farms have a small area which could be watered only with considerable difficulty. Under these circumstances, a separate competition for non-irrigated lucerne would be appropriate.

The natural hazard to irrigated pasture culture in the Maffra district is the topography of the land. The climate is ideal, the soil is fertile and receptive of moisture, and the irrigation supply is assured. The Glenmaggie weir is well situated to retain a large volume of water, but the problem of distributing that water to the farms has not been as straightforward as in many other irrigation districts. The northern channel with its tunnels and syphons represents the successful overcoming of an engineering problem, and similarly the contours of many of the farms are such that a considerable amount of engineering skill has been required to lay them out for irrigation. Some of the land is gently undulating with the result that paddocks cannot be formed readily into a series of parallel bays extending from one end to the other like a group of tilted billiard tables, as is the case in some areas. Flumes and fillbanks have to be constructed to distribute the water over the farm, and paddocks frequently water from two or more directions with bays varying in size and shape. Nevertheless the basic principles of the "border" system of lay-out are well understood, and all the areas exhibited were well laid out and evidently were capable of uniform watering.

White clover, perennial ryegrass and cocksfoot are the three species which predominate in the pastures of the district. Some of the pastures exhibited had contained other species such as red clover and alsike clover in the original mixture, but only odd plants remain. These species are sown usually to give a good growth during the first year or two while the white clover which is slower in becoming established, is developing. Pasture test plots established in the district in 1939 indicated that under local conditions such was not the case, but production was just as high during the first few years from a simple mixture as from a more comprehensive one.

A seeding of perennial ryegrass, cocksfoot and white clover appears to be all that is required to establish a first class pasture under Maffra conditions. However, there are two other species which are worthy of consideration; strawberry clover and prairie grass. The former will grow well in situations which are unfavorable to the development of white clover, such as low-lying patches where excess moisture is likely to accumulate, or high spots which get insufficient moisture, and its inclusion in the mixture may help to fill some of the gaps in the sward. White clover is the backbone of irrigated perennial pastures, but strawberry clover has a definite sphere of usefulness as a supplementary element. Prairie grass has intruded into

some of the pastures in the district, and its presence is an indication of high fertility. It is a species which makes good growth in the winter, it is palatable to stock, and the addition of two or three pounds of it to the seed mixture would be desirable.

The natural fertility of the soil in the Maffra district is such that the response to heavy dressings of superphosphate is not as marked as in some other irrigation districts. However, the regular application of this manure is necessary to maintain pastures and lucerne in full production. It is unlikely that an annual dressing of say 4 cwt. per acre would be a payable proposition, but a minimum of 2 cwt. per acre could well be adopted as a standard practice. Most of the exhibitors topdress regularly, but few of them in excess of a bag per acre, and many at the rate of 1 cwt. per acre. The persistence of subterranean clover in competition with white clover in many of the swards indicates the need for an increase in the rate of topdressing if maximum production is to be achieved. Many of the pastures inspected had a high percentage of weeds, and the stimulation of white clover production by liberal manuring and adequate watering, together with regular clipping of the pasture with the horse-mower should assist to reduce this element.

In areas which have a relatively impermeable soil, and particularly in the north of the State where hot conditions are experienced, it is necessary to water perennial pastures at intervals of not more than a fortnight during the summer months to maintain vigorous growth. The climatic and soil conditions at Maffra impose less stringent conditions, but the necessity for regular and adequate watering should not be overlooked. The 1945–46 season was characterized by good falls of rain in the late summer and autumn, and many of the competitors had watered less frequently than usual. It is true that the incidence of rain during the irrigation season may justify a modification of the watering programme, but it is also true that water is frequently withheld on account of rain which will not compensate for it adequately. A good steady fall of two or more inches of rain will obviously justify the postponement of an irrigation, but too often watering is postponed as a result of a fall of half an inch, or because it appears that rain is imminent. The exact amount of rain which has fallen should be determined before an irrigation is deferred, and in this connection, it may be unwise to attach too much significance to a recording taken ten or twenty miles away, as rain frequently falls unevenly over a comparatively small stretch of country. The presence of a rain gauge on the farm will inform the irrigator of the amount of rain his land has received during a given period. This information together with a knowledge of the quantity of water his ground will absorb at an irrigation, will enable him to judge the extent to which the rain will replace a regular watering. Careful consideration should be given as to just what a fall of rain means to the pasture before it is allowed to take the place of scheduled irrigation.

Grazing management is a feature of pasture development about which least is known. Experiments have been conducted to determine the best watering and manuring practices, and the results are conclusive—at least for the localities in which the trials have been carried out. Grazing tests, on the other hand, have not yielded precise information so readily, and there is still much to be learnt about the influence of various frequencies and intensities of grazing on the relative development of different species in the sward. All the entrants in the competition were in agreement that the pasture is utilized best by a system of subdivision and rotational grazing, but there was considerable variation in the length of the rotation period adopted. The stage at which the pasture is grazed will have a distinct bearing on the production and

Shelter belts on the property of Mr. H. A. D. Clyne.

well-being of the grazing animal, and the period of rest between successive grazings, which the pasture will require in order to attain an optimum stage of growth for the stock, will vary according to growing conditions and severity of grazing. The food intake of the animal will depend to some extent on the density of the sward, and this too is influenced by the grazing system to which the pasture is subjected.

Work in New Zealand and the U.S.A. has shown that a clover-dominant pasture is likely to give rise to undesirable taints in milk at certain times of the year. This trouble has been encountered in the Maffra district, where there is a definite tendency to clover dominance in many of the pastures. It is not suggested that the vigorous development of white clover is an undesirable feature of Maffra pastures, but rather that the grass element should be made to keep pace with the clover. White clover is the basis of irrigated perennial pastures; not only does it respond readily to favorable treatment and produce a large volume of highly nutritious and palatable fodder, but the thriftiness of the grass constituent depends largely upon its association with the clover. The maintenance of a grass-clover balance, which appears to be a problem in the Maffra district, is necessary in order to achieve maximum production, minimize nutritional disorders of grazing animals, and attain the highest quality in farm produce.

Grass production is stimulated by nitrogen, but the application of artificial nitrogenous manure is an expensive undertaking which is likely to give only a temporary fillip to grass production. The breaking up and spreading of animal droppings may help, and topdressing with superphosphate to induce clover growth will in turn add more nitrogen to the soil. However, the main line of development will have to be by grazing management.

Some farmers grazing a clover-dominant pasture on a short rotation have found that the grass element has been built up after the rotation has been lengthened. On the other hand, instances could be cited of pastures with a good grass-clover balance which are grazed on a short rotation. Grazing trials have been conducted at the State Research Farm, Werribee, for a number of years to endeavour to determine, among other things, the influence of various rest periods on the botanical composition of an irrigated pasture. Although there is evidence to show that some species are more susceptible to frequent grazing than others, there has been no indication to date that, under the conditions imposed, the frequency of grazing has any direct bearing on the grass/clover ratio in the sward. Observations have been made on a perennial irrigated pasture on which various rotations have been maintained rigidly for a number of years, and it has been noted that grass-dominance and clover-dominance have been induced concurrently on similar paddocks subjected to exactly the same rotations. Furthermore, some areas on which the same rotation has been maintained have changed from clover-dominance to grass-dominance and back to clover-dominance again over a period of years. (This latter feature possibly may be associated with a fluctuating nitrogen level in the soil.)

It is not intended to imply that the length of the rotation period does not matter. A longer rotation has many advantages over a shorter one from the point of view of the health and nutrition of the grazing animal. There is evidence to show that the chemical composition of pasture plants is determined to a large extent by their stage of growth, and the recuperation period the pasture is allowed between successive defoliations will determine the degree to which the stock are receiving a balanced diet. A rest period of three to four weeks has proved to be good practice for a perennial pasture, and it has several advantages over a shorter or longer rotation for a good deal of the year. But it is pointed out that in itself this will not necessarily ensure a balanced botanical composition. Other factors appear to be involved. The severity of grazing may exert a greater influence on pasture mixture than the length of the rest period. There may be a critical time when severe defoliation will retard the development of the plant, and if this time were not the same for all species, a hard grazing of a pasture at a period of susceptibility for one element would upset the balance. This upset could be accentuated at subsequent grazings by the stock concentrating on the attenuated species. These questions have yet to be elucidated fully, and a survey of pastures in the Maffra district might contribute to the information available concerning the relationship between the grazing system

adopted and the grass-clover balance in the sward; and to what extent this balance can be correlated with the incidence of stock complaints such as bloat, and the periodic occurrence of an undesirable flavour in the milk.

Mr. W. Vardy's winning lucerne exhibit at the autumn inspection.

The Awards

The winning pasture, exhibited by Mr. W. Clement, was sown eleven years ago on an old lucerne stand with a mixture of perennial ryegrass, cocksfoot, white clover, and red clover. An excellent sward has developed; cocksfoot and white clover are the dominant species with perennial ryegrass and prairie grass well represented. A few plants of lucerne and red clover still remain, and there is a sprinkling of subterranean clover. The area is topdressed annually with superphosphate at the rate of 1 cwt. or more per acre. Last year a bag per acre was applied. Mr. Clement has 98 acres of pasture and 22 acres of lucerne on the flat, where he is milking 80 cows, rearing calves and carrying a few horses. The area exhibited is grazed in rotation with other pasture paddocks, and the practice is adopted of never grazing a paddock right out before the stock are moved on. The mixture was well balanced, uniform, relatively free from weeds and in good pasture condition at each inspection.

Mr. W. Vardy has had irrigation water on his property for a few years only. During this time he has made remarkable strides, and he had the distinction of being placed highly in each competition. No fault could be found with his lucerne stand at the first inspection; it was well laid out, dense, uniform, free from weeds, and in excellent condition. The second inspection was held rather late in the autumn, and the lucerne was not in such an attractive state. However, this was common to all the areas exhibited, and the entry retained its winning lead. Mr. Vardy's pasture was a very attractive exhibit also. It was sown in the autumn of 1941 with a mixture of cocksfoot, perennial rye grass, white clover, and alsike clover. All of these species are still represented in the sward which is uniform and dense. Mr. Vardy harrows his pasture each winter.

Mr. D. C. Hurley, who was placed second in the lucerne competition, is in an "Outside District Sales" area. His lucerne paddock is laid out for irrigation, and although he had applied one watering only during the season, he had taken five cuts of hay off the area. The lucerne, which was sown four years ago, was in good condition at both inspections, but it had more weeds and a lower apparent yield than the winning exhibit.

Third prize in the pasture section was awarded to Mr. J. J. Mahoney, whose property—like that of Mr. Vardy—is in an early stage of development. The pasture was sown in the spring of 1944 with a mixture of perennial ryegrass and white clover; it was topdressed last year at the rate of 1½ bags of superphosphate per acre, and this year at the rate of 1 bag per acre. Both the species sown have developed well, and are intermingled in equal proportions in the sward which is blemished only by the presence of some spotted medic. Mr. Mahoney was unfortunate not to be placed higher in the lucerne competition. His stand was the best irrigated one seen at the second inspection; unfortunately it had been cut immediately prior to the first inspection and was, therefore, ineligible for points for condition and apparent yield.

Mr. F. H. Onley gained third place in the lucerne competition with a ten-year-old stand from which six cuts were made during the season. At the first inspection it was a very attractive exhibit, but—like many others—it was not in such good condition at the end of April.

The details of the awards are set out in the accompanying tables.

MAFFRA IRRIGATED PASTURE COMPETITION.

Awards.

Competitor.	Layout for Irrigation and Condition of Channel.	Condition of Pasture.	Uniformity.	Mixture.	Freedom from Weeds.	Total.	Grand Total.
Maximum Points	20	20	20	20	20	100	200
1. Clement, W.	18	19	19	19	19	94	186
	19	18	18	19	18	92	
2. Vardy, W.	19	18	18	18	18	91	185
	19	19	19	18	19	94	
3. Mahoney, J. J.	18	19	17	18	18	90	183½
	19	19½	18	18	19	93½	
4. Clyne, H. A. D.	19½	18	17	18	19	91½	182
	19½	17	18	18	18	90½	
5. Marks, N.	18	19	19	18	17	91	181
	18	19	18	18	17	90	
6. Davis, M.	19	18	18	18	18	91	180
	18	17	17	18	19	89	
6. Weatherley, R. ..	17	16	19	19	19	90	180
	19	17	19	18	17	90	
8. Pearce, E. S.	19	18	18	16	17	88	176
	18	19	17	17	17	88	
9. Onley, F. H.	19	17	18	18	17	89	174
	19	18	17	16	15	85	
10. Marshall, H.	17	18	18	17	17	87	171
	17	18	17	17	15	84	
11. Wiseley, A.	18	17	17	17	16	85	169
	18	17	17	16	16	84	
12. Wyeth, E. G.	17	17	17	15	15	81	165
	18	17	18	16	15	84	
13. Banks, W.	18	16	18	12	18	82	162
	17	17	17	12	17	80	
14. Schilig, J.	17	16	17	15	14	79	160
	17	17	16	16	15	81	

N.B.—Points allotted at first inspection shown on top in each case.

MAFFRA LUCERNE COMPETITION.

Awards.

Competitor.	Layout for Irrigation and Condition of Channel.	Condition (including Quality of Fodder Crop should Produce).	Uniformity.	Apparent Yield at Time of Inspection.	Freedom from Weeds.	Total.	Grand Total.
Maximum Points	20	20	20	20	20	100	200
1. Vardy, W.	19½ 18	19½ 16	19½ 18	19½ 16	19½ 19	97½ 87	184½
2. Hurley, D. C.	19 19	19 18	18 19	18 16	18 16	92 88	180
3. Onley, F. H.	17 18	19 16	18 18	18 17	19 16	91 85	176
4. Hipwell, M. C. and F. J. ..	17 17	18 16	18 18	17 17	19 17	89 85	174
5. Wiseley, A.	18 16	18 5	18 17	18 14	19 18	91 70	161
6. Davis, M.	18 18	17 10	17 17	16 10	18 18	86 73	159
7. Banks, W.	.. ..	18 19	18 19	19 19	19 19½	74 76½	150½
8. Hallows, H. J.	.. ..	19 19	18 19	18 18	19½ 19½	74½ 75½	150
9. Mahoney, J. J.	17 18	* 18	19 19	* 16	19 19½	55 90½	145½
10. Pearce, E. S.	17 18	19 12	18 15	18 5	17 5	89 55	144
11. Marks, N.	.. ..	17 19	17 18	15 18	19 19	68 74	142
12. Schilig, J.	.. ..	18 15	18 18	18 17	19 17	73 67	140
12. Wyeth, R. G. ..	.. ..	18 17	16 18	17 18	18 18	69 71	140
14. Wiseley, D.	.. ..	17 10	18 18	16 12	19 16	70 56	126

* Cut just prior to inspection.

N.B.—Points awarded at first inspection shown on top in each case.

DAIRY FARMERS!

Do You Realise?

1. Victoria is Seriously Short of Dairy Cattle
2. In 1943 there were 1,445,530 Dairy Cattle
3. In 1946 there were 1,299,769 Dairy Cattle
4. This Downward Trend Must Stop
5. Calves can be well Reared on the following Ration:—

   1½ gallons of new milk per day for two or more weeks, a mixture of new milk and skim milk or gruel during the next three or four weeks, followed by 2½ gallons of skim milk or gruel until weaned, with adequate PASTURE, HAY and CHAFF

Further Information:—

May be obtained from the pamphlet "Dairy Calves," which will be forwarded free on application to the *Director, Department of Agriculture, Melbourne, C.2*

• YOU CAN HELP

REAR MORE HEIFER CALVES

-: LIVE STOCK NOTES :-

Compiled by A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer*

More About Calf Rearing

THE present crisis in the dairying industry should emphasize the often overlooked fact that calf rearing is an integral part of dairy farming and should encourage more farmers to set up permanent calf-rearing facilities. Such facilities need not be expensive and may comprise three good pasture paddocks with moveable or fixed shelters with dry, well-drained floors capable of housing all of the calves comfortably. In addition, a yard with feeding bails is most desirable. The feeding bails need not be roofed over, but a concrete floor to the yard and in front of the bails where the buckets rest is advisable. If there are more calves than bails, an additional holding yard will be required. After feeding, the calves should be let out into one of the pasture paddocks.

The pasture paddocks should be so fenced that the feeding yard opens into the three of them, and the feeding yard should be in a convenient position to the separator room. The skim milk and other feed should always be carried to the calves in clean buckets and not pumped in pipes which cannot be kept clean. The area of the calf paddocks is important and should be in relation to the number of calves reared and the carrying capacity of the pastures. Eight to ten calves should be allowed the same area as a milking cow. Thus, if it takes two and a half acres to maintain a milking cow, the total area of the calf paddocks where 40 calves are being reared should be at least ten acres.

The three calf paddocks should be grazed rotationally, each paddock being continuously grazed for ten days and continuously rested for 20 days. If no calves are being bucket fed, the calf paddocks may be grazed by horses for preference, or sheep or pigs. Cattle should not be grazed in them if the owner wishes to ensure that his calves are kept free of worms or other parasitic organisms. Of course any surplus grass in the calf paddocks may be cut for hay or silage.

The shelters should be open and face the north. Shelter trees along the southern and western fences will protect the calves from the cold, prevailing winds in the winter. Adequate shelter should not be overlooked, especially as well-reared, early calves always make the best cows.

Water laid on in troughs is preferable to water holes. Feed troughs should be available and good quality lucerne, oaten, or grass-hay chaff offered to the calves in them. It is a good plan to offer the calves some good-quality chaff after they have been given their bucket feed. Calves start to nibble at about a week old and do better if some dry feed is given in addition to the bucket feed and grazing.

✶

Sheep Shows and Sales

The Annual Sheep Show conducted by the Australian Sheep Breeders Association will be held at the Wool Stores of Dalgety & Co. Ltd., Newmarket, from Monday to Wednesday, 29th to 31st July, 1946. The Show will be followed by Stud Sheep Sales which will be held at the Wool Stores of the Commonwealth Wool and Produce Co. Ltd., Sutton St., North Melbourne.

All breeds of sheep will be represented at this Show, and first-class entries have been received. A very large number of good stud and flock rams and ewes will be offered at the sales, where intending buyers should be able to obtain their seasonal requirements.

At the Melbourne Royal Show which will be held at the Showgrounds, Flemington, between the 19th and 28th September, all breeds of sheep with the exception of Merinos will be exhibited. The sheep will be judged on Monday, 23rd September, and later in the week sales will be conducted when intending buyers of Polwarth, Corriedale, and the various British breeds should be able to secure their requirements.

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Pig Production Is Rapidly Decreasing

Pig production in Australia in 1945 amounted to 119,000 tons of carcasses, compared with 130,000 tons in 1944. Although 1944 production was increased by the carry-over of pigs from 1943 necessitated by the restriction placed on the slaughter of light pigs for pork since August, 1943, the drop in production from 1944 to 1945 indicates a downward trend in pig breeding. Victoria's contribution in 1945 was 22 per cent. of the total Commonwealth production.

In the first quarter of 1946, Australian production of pig carcasses was 26,000 tons which, compared with 32,000 tons in the first quarter of 1945, reveals a rapid decline in pig breeding in all States.

Among the several reasons for decreased pig production, the shortage of pig foods is of greatest importance. There has been an insufficiency of cereals since late in 1944 and the price of wheat was increased late in 1945. The milk supply for pig feeding was reduced by drought and by the diversion of milk from the butter trade to the whole-milk and condensed-milk trades, leaving less separated milk for pigs. Meatmeal is still in short supply for pig raisers and the reduction of Army Service camps has deprived some pig farmers of food refuse which they had previously collected from these camps.

The downward trend of pig breeding is expected to continue until there is again an abundant supply of cereals for pig feeding.

[L. A. Downey, H.D.A., Pig Expert.]

✶

Chicken Rearing

Success in the production of strong, vigorous chickens depends largely on the quality of the breeding stock from which they are produced. The period of the year in which the chickens are hatched is also an important factor. The months of July, August, and September have always been considered ideal for the production of the best chickens, but it cannot be overemphasized that success also depends largely on careful rearing of the chickens during their early life.

Clean, warm, well-ventilated, comfortable quarters must be provided for the chickens immediately they are removed from the incubator. Ideal conditions for the chickens are those which provide open grass runs in front of the brooder house, and

subsequently in colony houses on free-range, as soon as they can do without artificial heat, which is, approximately, at four to six weeks of age, depending upon the weather.

Only a portion of the outside grass runs outside the brooder house should be available to the chickens at the one time. Moveable hurdles will allow fresh areas to be reserved for later batches of chickens.

Chickens should not be left in the warm brooders too long. They should be transferred to clean, open-range conditions, where they will receive fresh air, sunshine, and the freedom so essential for their best development.

[H. F. CLINTON, Poultry Expert.]

★

Bee-keeping Notes

Colonies wintering on Grey-box and Ironbark honey are suffering from dysentery in many districts, and if this honey is not removed and replaced with good stores immediately, losses will be heavy, and surviving colonies will open up in poor condition in the spring.

It is advisable to remove surplus combs of honey and crowd the bees down to the combs that the cluster will be able to cover in the coldest weather. In addition, it is advisable to remove the four centre combs from the brood nest, extract from them the stores—irrespective of brood being present—and replace the extracted brood comb. When this is done feed about 10 lb. of sugar syrup, or some good quality wintering honey, such as stringy bark, messmate or tea tree.

It is most convenient to feed in 5 to 7 lb. lever-top honey tins placed inside an empty hive body, above the cluster of bees.

Punch about 20 small nail holes in the lid, press home tightly, and invert the feed over the top bars of the frames. Atmospheric pressure will prevent the feed from running to waste, and the bees can work it in the coldest weather. The honey can be diluted slightly, and fed warm, preferably at dusk.

The bees will use the new stores, and if sufficient is given, they will not be forced to use the inferior wintering quality honey, until late in the spring, when it will be less detrimental to the colony.

During the winter and early spring, condensation of moisture within the hive is very noticeable, and this has a tendency to thin down, and sour the honey in combs not covered by the cluster of bees. It is generally absent in windy weather, or dry days. A small-top entrance is an advantage in circumstances where condensation is very heavy, as it allows the moisture to escape. It can be easily made by tacking $\frac{3}{8}$th inch cleats under the cover, leaving a small exit. With the migratory cover, the ventilation holes allow the moisture to escape.

[W. A. COLLINS, Apiary Inspector.]

CHEMICAL and ORGANIC MANURES in VICTORIAN AGRICULTURE (*continued from page 302*)

of the soil be maintained, but it is equally essential that chemical manures should be added when these are deficient in the soil.

To quote from "The Waste Products of Agriculture, 1931", one of the earlier works of Sir Albert Howard himself, a statement which appears to have been overlooked or ignored by many of his later adherents, "The full possibilities of humus will appear only when the dressings of compost are supplemented by the addition of suitable artificials. The combination of the two applied at the right moment and in the right proportions, will open the door to intensive crop production".

It is evident then from a study of the figures given in this article that broad generalizations cannot be made to cover manurial practices even over a small State such as Victoria, much less over conditions in various parts of the world. Where one soil or one crop may need organic manure, another will be deficient in one type or other of chemical fertilizer, while yet another will need both forms of manure for its best growth. Only by conducting many and varied experimental tests over a period of years and by studying the economic as well as the practical considerations of the different manurial treatments can we hope to be able to say what is the best.

LIVE STOCK STATISTICS

The following live stock statistics for Victoria have recently been released by Mr. O. Gawler, Victorian Government Statist:—

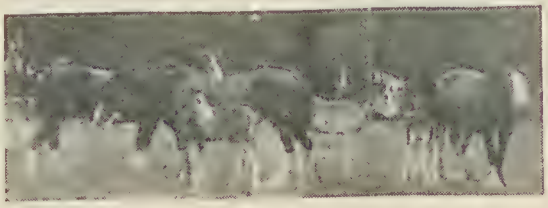
—	At 31st March, 1946.	At 31st March, 1945.	At 31st March, 1944.	At 31st March, 1943.
Horses	232,473	253,782	277,662	292,534
Dairy Cattle	1,299,769	1,364,202	1,406,028	1,445,530
Beef Cattle	527,318	538,908	607,005	577,362
Total Cattle	1,827,087	1,903,110	2,013,033	2,022,892
Pigs	271,887	296,232	337,878	307,929
Sheep	14,655,277	16,457,101	19,220,457	19,614,040

The numbers of dairy cattle are split up as follow:—

—	At 31st March, 1946.	At 31st March, 1945.	At 31st March, 1944.	At 31st March, 1943.
Milking Cows	629,046	591,437	611,599	642,110
Dry Cows	182,353	267,763	263,197	235,054
Springing Heifers	71,247	66,107	63,688	247,374
Other Heifers	200,855	201,158	211,317	
Calves	181,170	202,258	218,970	281,512
Bulls	35,098	35,479	37,257	39,480
Total	1,299,769	1,364,202	1,406,028	1,445,530

A study of these tables shows how the stock population has been affected by war and drought. The number of calves is over 100,000 below the number in 1943, the last normal year. As a result of the present good season, the proportion of milking to dry cows was very high when the statistics were collected.

The numbers of sheep at present in Victoria are the lowest for 20 years and horse numbers are just half what they were 20 years ago.



Seasonal Conditions of Sheep and Cattle

By A. R. GRAYSON, B.V.Sc., *Senior Veterinary Officer*

The severe drought conditions which prevailed generally over almost the whole of Victoria during 1945, have, following the splendid late summer and early autumn rains, been followed by a period of rapid lush growth. The mild, spring-like weather which followed the rains encouraged the growth of pasture, and stock which had been carried through the drought under considerable difficulty, began to improve rapidly in condition. Unfortunately for the stock-owner, however, the prevailing conditions of mild humid weather and luxuriant pasture growth predisposed towards a high incidence of several differing disease conditions in both sheep and cattle. This set of conditions called for the exercise of a high degree of skill in animal management, both in an endeavour to prevent the onset of disease, or failing this, to control the disease when it made an appearance.

DISEASES which have appeared or may appear in sheep under these conditions are foot-rot and foot abscess, pregnancy toxæmia, hypocalcæmia, and entero-toxæmia. In cattle, foot-rot and foot abscess, milk fever, and grass tetany may all present problems.

FOOT-ROT and FOOT ABSCESS

Foot-rot and foot abscess are allied conditions both associated with lameness caused by abscess formation in the hoof and/or soft tissues around the coronet.

True foot-rot is a highly contagious condition and is transmitted by carriers. Routine inspections of all sheep in the late summer and early autumn, together with the paring of any mis-shapen feet and the use for all sheep of a foot-bath containing a 5 per cent. formalin or a 10 per cent. copper sulphate solution would have helped

A luxuriant pasture such as the one pictured above may cause digestive upsets in ruminants unless balanced with roughage and a mineral supplement containing calcium and some molasses. Such pasture growth may also predispose both sheep and cattle to foot-rot.

to control the condition. If cases occur, the immediate isolation of all affected sheep and the individual treatment, at frequent intervals, of these cases is essential. This treatment must consist of the thorough trimming of the hoof followed by an antiseptic treatment, i.e. 2½ to 5 per cent. formalin solution, 10 per cent. bluestone solution, etc., which will destroy the causal organism and assist healing of the affected parts. All non-affected sheep should be placed in a foot-bath for half an hour, and then held in draining yards or sheds until the feet have dried before being put out on fresh pasture. Introduced sheep, including rams, should be similarly inspected and treated.

Dry Camping Area Desirable

The provision of a dry camping area is a definite help in the control of this condition. This can be provided by ploughing, and keeping bare, an area of about an acre in the highest part of each paddock. It will be found that sheep will make use of such an area which will enable them to keep their feet dry and less susceptible to scald, which is a pre-disposing factor towards both foot-rot and foot abscess. This latter condition can be treated in a similar manner.

Surgical Treatment of Sheep

Surgical interference must be drastic and result in the opening up, to give a complete drainage, of all abscess formations and must be followed by suitable antiseptic treatment to promote healing. Where the abscess has been deep-seated and the surgical interference necessarily severe, the aim must be to promote healing from the depth of the wound. Irritant dressings, or drugs, which, if absorbed into the system, would involve the risks of poisoning, should not be used. In this class must be included strong copper sulphate solutions and any arsenical preparations. A 1 per cent. formalin solution would be satisfactory in these cases.

Treatment of Cattle

The treatment of affected cattle presents greater difficulties, but, when necessary, should be along similar lines, including foot-bath treatment. With dairy cattle the provision of raised, even, and well-drained approaches to the milking yards will prevent injuries to the feet and lessen the incidence of the condition.

All of the other disease conditions mentioned in both cattle and sheep may be classed to some extent as nutritional. The provision of an adequate balanced ration, including roughage, and the necessary mineral supplement will help to reduce the number of cases.

PREGNANCY TOXÆMIA and HYPOCALCÆMIA

In sheep both pregnancy toxæmia and hypocalcæmia are seasonal in incidence. The former, as its name indicates, attacks in-lamb ewes, whilst the latter, which occurs under the same conditions, can affect both in-lamb and suckling ewes, as well as dry ewes, and, at times, wethers. In a season such as the present, when sheep have been maintained through a drought and have since been grazing on quickly-developed, rich, lush pastures, both conditions may be expected. Control lies in an attempt to maintain an even plane of nutrition. Where supplies of conserved fodder—meadow or oaten hay—are available, these should be fed to the sheep with molasses as a desirable adjunct. In most cases, however, all conserved fodder will have been used and in these cases it will be found advisable to graze sheep on portion of the property only and keep the feed on that portion under control. Under these circumstances regular, frequent, compulsory exercise of the flock will be necessary.

Treatment for pregnancy toxæmia is not very satisfactory but drenching twice daily with 6 ounces of molasses in the same amount of water may effect a cure in early cases.

In hypocalcæmia cases, half an ounce of calcium borogluconate dissolved in two ounces of boiled water and injected subcutaneously gives a very good result except with pregnant ewes.

ENTERO-TOXÆMIA

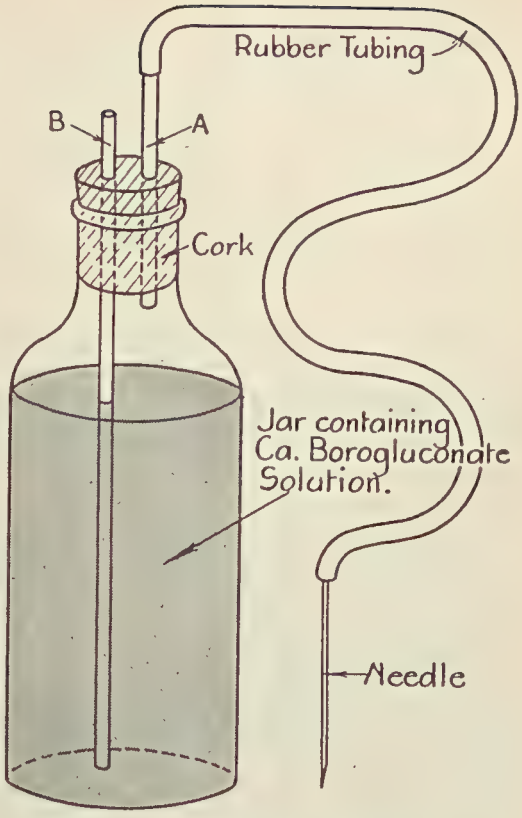
For entero-toxæmia ("pulpy kidney") control, exercise and the provision of roughage can be recommended. The use of vaccines against this disease has given good results, both when inoculated into the pregnant ewe, or into the lamb. It is interesting to note that the Commonwealth Serum Laboratories have been conducting experiments, under field conditions, in the use of a pulpy kidney anti-toxin which is de-

signed to provide an immediate passive immunity to the lamb when cases are actually occurring in the flock. The immunity so conferred would be sufficient to protect the lamb over the danger period. Results to date have been promising and it is anticipated that limited supplies will soon be available to stock owners.

MILK FEVER and GRASS TETANY

Two seasonal diseases of dairy cattle which can be expected are milk fever and grass tetany. The former occurs within a few days of calving, whilst the latter commonly occurs 3 to 4 weeks after calving. Both may be said to be due to an upset in the calcium-magnesium blood content ratio, milk fever being an acute hypocalcæmia and in grass tetany there is usually a low magnesium content of the blood serum.

Preventive measures against both conditions should consist in the endeavour to maintain normal body functioning. To this end, a balanced ration containing a sufficiency of fibre, which is essential for correct bowel functioning in ruminants, should be fed and a mineral supplement containing calcium, with molasses as an adjunct, should be made available to the cows. A suitable mineral lick would be one consisting of bone-meal or bone-flour 1 part, salt 2 parts. The molasses could be mixed with the lick or provided separately. As a further step in preventing the onset of milk fever, the subcutaneous injection of a half-dose of calcium borogluconate (1¼ oz. in 5 oz. of water) could be given to susceptible cows immediately after calving and repeated in 24 hours. The period of greatest susceptibility in the dairy cow corresponds to the period of greatest production—that is, from 5 to 8 years. After-calving drenches consisting of Epsom salts and molasses, 1 lb. of each in 1 pint of water would help in the control of both milk fever and grass tetany. On no account, however, should such a drench be administered if the cow is down, affected by either condition. In the actual treatment of grass tetany cases good results have been claimed following the subcutaneous injection of magnesium sulphate (Epsom salts) 2 oz. in 8 oz. of sterile water.



Siphon apparatus suitable for subcutaneous injection with calcium borogluconate.

STOCK FOODS ACT

Brands Registered for 1946

By W. R. JEWELL, M.Sc., *Chemist for Agriculture*

IN a number of respects the *Stock Foods Act* is similar to other Acts in Victoria designed to protect the farmer in the purchase of commodities necessary to successful farming. Every manufacturer of mixed, concentrated or prepared stock foods, by-products and stock licks is required to apply for registration of the brands of such materials he proposes to sell. On the application for registration he must state the raw materials from which the food is made and the guaranteed analysis, in terms of the minimum amounts of protein and fat, and the maximum amount of fibre; in the case of a stock lick, the analysis must show the percentage of certain mineral constituents. It is an offence to sell an unregistered stock food.

Labels must be attached to each bag showing the name and address of the manufacturer or importer, the brand, the guaranteed analysis and the weight (net or gross). In the case of bran and pollard the analysis is not required, as standards have been set out for these by-products with which all bran or pollard must comply. The chemical standard is given in the list of registered stock foods, under the section dealing with bran and pollard. In addition, these by-products must be free from adulteration and, in the case of pollard, must be sufficiently fine that at least 99 per cent. passes through a standard sieve having round holes $1\frac{1}{2}$ millimetres in diameter.

The legislation is designed to protect and assist all farmers using these stock foods. Inspections are made at source of manufacture or in stores, and samples are analysed for comparison with guaranteed analysis; it is an offence against the Act if any such sample is found not to comply with the guaranteed analysis. As the value of a stock food depends largely on its content of protein, fat and fibre, the analysis printed on the label should assist the farmer in assessing the merits of any particular food and in using it in mixing rations for any particular purpose.

Prior to the war, the list of registered stock foods was published in this Journal, but publication was discontinued during the war owing to shortage of paper. The list for 1946 appears in the back section of this issue and should be of interest to all farmers. The various types of stock food are grouped together for easy comparison. Apart from by-products of various kinds, there is a large number of mixed stock foods for various specific purposes.

Standards have been proclaimed for feeding meals of animal origin, viz., blood meal, meat-meal and meat and bone meal, and the respective standards are shown in a footnote to the list. During the present shortage of meat-meal, bone and meat-meal (where bone predominates) has been registered, with a minimum protein content of 40 per cent.

For the first time the list includes vitaminized oils, including cod liver oil, and other fish-liver oils reinforced or not with added vitamins. The Act requires that the guaranteed minimum amount of vitamins present must be shown on the label, in terms of international units per gram. The list of stock licks is not as extensive as in past years; recent investigations have shown that the need for mineral supplements in Australia, particularly for sheep, is not as great as was originally believed. Mineral mixtures, usually of a relatively simple form, are, however, necessary as a supplement to certain types of feeding.

Enquiries regarding registered stock foods, or the operation of the *Stock Foods Act*, and any information regarding the sale of unregistered or unlabelled stock foods, should be addressed to the Chemist for Agriculture, State Laboratories, Melbourne.

Efficiency in Use and Control of Irrigation Water

Central Gippsland Competitions

By J. A. AIRD, B.Sc., B.Agr.Sc., *Chief Irrigation Officer, and* H. B. LINCOLN, C.E., A.M.I.E., *Executive Engineer, State Rivers and Water Supply Commission*

Glenmaggie Weir from the upstream side.

FOR a number of years the Maffra Agricultural Society, in co-operation with the State Rivers and Water Supply Commission, has conducted a competition for "the farm with the most efficient use and control of water". This year the Sale Agricultural Society decided to hold a similar competition, and reports on both competitions are given in the following article.

Twelve entries for the Maffra competition were received from Newry, Tinamba, Riverslea, and Boisdale, while ten entries for the Sale Agricultural Society's Competition were received from Montgomery, Myrtlebank, and Somerton Park. Thus practically the whole of the Maffra–Sale Irrigation Water Supply District was covered by the two competitions.

The efficiency of water use in irrigation may be considered either from the standpoint of the amount of water supplied, the quantity used by the plants, or by returns obtained per unit-quantity of water. In the competitions under review it was decided that the most practicable way to judge them

Mudbanks in channels are undesirable in that they cause loss of time, labour and earth, and give poor control of water.

was by comparing the methods used to ensure efficiency. Points, therefore, were allotted as follows :—

Irrigation—Methods of irrigation and layout of property, 25 ; methods of controlling water, 15 ; cleanliness of channels, 15	55
Drainage Facilities and Cleanliness of Drains	25
Provision of Water for Stock ..	10
Records of Waterings	10
Total	100

Few of the entrants in the Newry section had previously taken part in these competitions and the same applied to the Sale competition. Entrants in the Boisdale section, however, had previously competed.

The high standard of the grading, channelling, and check-banking as shown in previous competitions was well maintained and it is apparent that this comparatively new irrigation area has profited by the experience gained in the older established districts. With the possible exception of one case the lengths of run were kept to reasonable limits. In some instances points were lost through minor defects such as small areas being missed, &c. Flumes are used on some blocks to irrigate isolated areas.

Permanent structures to control water in the irrigators own ditches were conspicuous by their absence, in most cases temporary bag or corrugated iron stops being used. In three cases, however, the placing of permanent concrete stops had been commenced, and in others a satisfactory type of wooden stop was being used. With the comparatively steep grades which many of the distributary channels have to follow, further provision would be necessary.

Except in one case, no provision had been made for permanent outlets, such as pipes or small concrete structures, from the channel to the bays. This is a matter which may well receive the attention of irrigators.

Channels were free of "cumbungi" and reeds, but the seasonal conditions had caused an abnormal weed growth, and in many cases *paspalum distichum* is a real problem. This growth, combined with the fact that at the time of inspection it was expected that no further waterings would be needed this year, resulted in many of the channels showing a neglected condition.

With regard to drainage, none of the blocks in the Maffra competition are in the constituted drainage district, consequently the provision of drainage is dependent on the natural creeks and depressions which abut or intersect most of the blocks. These creeks and depressions are well defined and little or no work is required in many cases for the disposal of surplus irrigation and drainage water. In the allocation of points chief consideration was given as to how much these facilities can be used, what proportion of the irrigated areas are served, and what the irrigator has done to make the best use of them.

The provision of a comprehensive drainage system, while necessary in irrigation areas where natural facilities do not exist, is not an unmixed blessing, as experience has shown that once installed the percentage of waste water rises very considerably.

The soils in the area are very permeable and with the layout on reasonably good grades water does not pond and cause damage. Practically no bare or soured patches due to this cause were noticed during the inspection in the Maffra area.

In the Sale area, however, the soils have heavier subsoils containing dense clay bands and, even prior to irrigation, there were

certain areas in which water ponded in wet seasons and in drying brought saline substances to the surface; there are not, as in the Maffra area, continuous defined water courses which act as natural drainage lines and in order, therefore, to cope with the heavy falls which may occur any summer, the provision of a district drainage system was necessary. This has, to some extent, improved the condition of a number of these spots.

The provision of stock water was generally very good and provides a good object lesson to irrigators in the older established districts who rely mainly on water left in the irrigation channel during the off season.

Owing to an underlying stratum of gravel at a comparatively shallow depth in the Maffra area excavated dams will not hold water and, as the channels are drained off and would not in any case hold water for any length of time, recourse has been made to bores and wells. The wells are of comparatively shallow depth, generally from 12 to 20 feet, lined with brick or concrete and fitted with windmill and tanks. The water is distributed by pipes to concrete or steel troughs placed at convenient points and fitted with ball taps. The concrete troughs used are well made, long and wide enough to provide ample room for stock drinking. There are adequate supplies of good water available by this means, and it is stated that stock prefer this ground water to that in the channels, creeks and billabongs.

The competitors were lax in the matter of keeping records. Two competitors kept records of the waterings on different paddocks,

Although easily made, a channel of this type wastes both water and time.

A clean drainage channel allows a free and even flow of water.

three others did little more than keep a register of the water deliveries as a whole, while the remainder kept none at all, but depended on the water bailiff. It should not be a difficult matter to establish a system of records by tabulating the various paddocks with areas, dates of starting and finishing watering, and quantities used. These latter may have to be estimated if the meter serves more than one paddock. A good method is to have a plan of the block on a fairly large scale, showing area, type of pasture, &c., and the information shown in different colours for each year. The keeping of such a record, once established, will involve very little time, and besides being really necessary if efficiency is aimed at, is an interesting study in itself, and if linked up with the different agricultural operations, such as seeding, manuring, cutting (where done), and cultivating, as against the stock carrying capacity, would tend to show any weaknesses and give some indication where improvements could be made.

THE MAFFRA COMPETITION

The Maffra competition was won by Mr. T. Harvey of Boisdale. A feature of Mr. Harvey's farm was the amount of well-constructed concrete-lined channels and flumes, which had the effect of considerably increasing the efficiency of the internal irrigation system. Second prize was won by Mr. E. J. Pearce also of Boisdale. Both of these farmers were entrants in previous competitions and the high standard of layout and efficiency then shown has been well maintained and their farms are well worth inspection.

Home-made concrete stops on the property of Mr. E. G. Wyeth, Newry.

were well laid out and, considering the season, the channels were reasonably clean. As was general in all farms in this competition, there were no outlet structures in the farm channels, but in both cases there were good concrete stops in, and culverts over, the channels.

It will be noticed that Mr Semmens was slightly better on all points in connexion with the layout of the holding, but lost 8 points as compared with Mr. Arnup who kept records of water used. Although the bailiff keeps a record of the quantity of water used, he does not record the paddocks it is used on and, for economical management, it is essential that a record be kept of where the water is used at each irrigation.

Many of the other entrants, all in the Newry district, are developing their holdings on proper lines and with more provision of permanent structures and attention to details such as keeping records of watering, will in the future seriously challenge the winners of this competition.

The points scored by competitors who obtained over 60 per cent. are tabulated on page 323.

THE SALE COMPETITION

In the competition organized by the Sale Agricultural Society Messrs. J. K. Semmens and J R. Arnup were level in first place with 79 points and share the 25 acre feet of water allotted as first and second prizes. Both of these farms were in excellent order,

It is interesting to note that, of the first four farms in this competition, three were originally made available for migrants under the overseas settlement scheme of 1924–28. The points received by competitors who obtained over 60 per cent. are given hereunder. It will be seen that in practically all cases high points were obtained for "layout" and that the points were lost through lack of records, inadequate provision for stock water, and state of channels and drains.

EFFICIENT USE AND CONTROL OF WATER COMPETITION, SALE DISTRICT.

The Awards.

Competitor.	Area Acres.	Water Supply.			Drainage.	Water Supply for Stock.	Record of Waterings.	Total.
		Layout.	Structures.	Cleanliness of Channels.				
Possible points	..	25	15	15	25	10	10	100
J. R. Arnup, Myrtlebank ..	67	23	10	12	18	8	8	79
J. K. Semmens, Wilson's Estate	62	25	12	14	20	8	..	79
H. C. Cowie, Myrtlebank ..	131	23	8	10	18	4	10	73
E. Langford, Somerton Park ..	42	23	12	12	14	4	8	73
Thos. Smith, Somerton Park ..	72	23	12	11	20	4	..	70
R. O. Martin, Myrtlebank ..	70	23	10	10	18	5	..	66
F. Wilson, Sale	70	20	10	10	15	10	..	65
H. Napper (No. 1), Sale ..	160	25	5	13	15	4	..	62
L. Senini, Montgomery ..	73	23	10	10	13	5	..	61

All of these matters are not difficult to remedy and it is hoped that by the time the next competition is held these will be remedied, and the judges given a real headache in deciding the winner.

EFFICIENT USE AND CONTROL OF WATER COMPETITION, MAFFRA DISTRICT.
The Awards.

Competitor.	Area Acres.	Water Supply.			Drainage.	Water Supply for Stock.	Record of Waterings.	Total.
		Layout.	Structures.	Cleanliness of Channels.				
Possible points	..	25	15	15	25	10	10	100
T. Harvey, Boisdale	81	25	14	12	15	10	7	83
E. J. Pearce, Boisdale ..	86	25	12	10	15	10	7	79
E. J. Wyeth (D. R. Manson), Newry	150	23	10	10	15	10	..	68
H. J. Hallows, Newry ..	61	23	5	10	15	8	5	66
N. Marks (D. R. Manson), Newry	134	23	5	5	20	10	..	63
H. J. Marshall (D. R. Manson), Newry	150	20	5	5	15	8	10	63
—. Banks (H. A. D. Clyne), Newry	211	20	10	12	15	5	..	62
D. V. Wiseley (D. R. Manson), Newry	150	20	7	5	20	10	..	62
J. J. Mahoney, Newry ..	79	25	5	12	10	10	..	62

FARM LAYOUT, FARM BUILDINGS, STOCKYARDS, etc.

Farmers Invited to Submit Plans

No doubt there are many Victorian farmers with original ideas on farm layout, farm buildings, stockyards, &c., who have put their plans into execution on their own properties. Such plans are frequently quite useful, but rarely achieve more than local publicity, and to remedy this state of affairs the Department of Agriculture proposes, on the suggestion of a reader, to invite farmers to forward sketch plans or suggestions on farm layout, farm buildings, stockyards, or farm labour-saving devices. In this way useful ideas will have the benefit of wide circulation in the Journal, and may prove of considerable value to farmers throughout the State. Approved plans will appear in the Journal and a fee of £1 1s. will be paid for each plan published.

Plans and suggestions should be forwarded to the Director of Agriculture, Department of Agriculture, Melbourne, C.2.

IRRIGATED CROP AND PASTURE COMPETITIONS

Appin - Cobram - Pyramid Hill

By R. H. BEATTIE, B.Agr.Sc., *Assistant Agrostologist*

THE reports detailed in the following article deal with irrigated farming competitions conducted in the Appin, Cobram, and Pyramid Hill districts during the 1945–46 season.

In the first section the practice of irrigation in relation to the crops and pastures exhibited is discussed and the three competitions are then reported on separately.

An important purpose of farm competitions is to provide an extension service for farmers whereby trained officers of the Department of Agriculture may meet farmers on their own properties and discuss problems with them on the spot. By this interchange of ideas, farmers are frequently encouraged to practise better methods of production with benefit both to themselves and the nation.

The crops exhibited in the abovementioned group of competitions were pastures, lucerne and summer fodder crops, all grown under irrigation conditions.

Irrigated Pastures

A pasture sward may consist of perennial species, of annual species, or a mixture of both. For perennial species to persist in a pasture, moisture conditions throughout the summer period must be satisfactory, and the soil reasonably fertile. Under natural rainfall conditions, there are few areas in Victoria where summer rainfall is sufficient either in amount or frequency, to allow perennial pasture species to thrive. However, in irrigation districts where irrigation water is available throughout the hot summer period at frequent intervals (which would mean about ten days and certainly no longer than fourteen or fifteen in our Northern irrigation areas) perennial pasture species, as typified by white and strawberry clovers and perennial rye grass and cocksfoot, luxuriate.

Unfortunately, however, there are extensive areas to which only a limited quantity of water is available, and to allow irrigators sufficient water during the summer period to produce high-class perennial pastures, would mean drastic curtailment of the area at present receiving at least some benefit from irrigation. In the writer's opinion the greatest benefit has been offered to the greatest number in the "1 in 4" and the "1 in 5" areas.

Subterranean clover and Wimmera rye grass are species that have fitted into the irrigated agriculture of districts with a limited supply of irrigation water. The improvement over the natural productivity has been remarkable in these areas, and must be witnessed to be realized. Despite the unquestioned merit of the perennial pasture, which is the ideal type, it has been the annual sub-rye grass pasture that has increased the agricultural productiveness of this State to the greatest extent, and this type of pasture will remain the basis of pasture improvement for a long time to come. In the extensive irrigation areas, one often sees small paddocks of white clover and perennial rye grass making quite a good show, and the question arises as to why more of this type of pasture cannot be grown in these parts, seeing that it will grow quite effectively there. However, as sufficient water is not available to maintain a large scale development of this nature, the agriculture suited to present conditions must necessarily be practised.

White clover, perennial rye grass and cocksfoot, where they can be grown effectively, produce a pasture second to none, and are adaptable to a wide range of soil types and environment. Once established, their recuperative powers and quick response to

good treatment are outstanding. For continuity in a satisfactory state, they require a reasonable level of fertility and, being perennial types, moisture within their root zone throughout the year. In northern areas, where long, dry summers prevail, this will entail irrigations at intervals of ten days to one fortnight during the hottest and driest part of the year. In the " one in one " areas, permanent pastures of perennial species can be established and kept in a state of high productivity. We find to-day that these areas are almost exclusively given to pasture, and lucerne stands are the exception rather than the rule. However, history shows that in many cases, the pasture as we find it to-day in the older irrigation areas, is an inheritance from the old lucerne stands of years ago. The development that has taken place in these districts will be a pointer to what might be expected in other northern districts in the future. It appears that lucerne, apart from its great value as a fodder, plays the role of a most valuable pioneer plant in the development of perennial pastures.

Lucerne

The value of lucerne as a crop cannot be overstated. It has certain peculiarities which could justify the statement, that in a general way, lucerne grown under irrigation is harder to manage than perennial pasture. The facts are that lucerne will scald out very quickly when excess water lies on it without draining away, while perennial pasture is more tolerant in this respect. On the other hand, lucerne can go longer between waterings in similar conditions of soil and climate than pasture, and be less affected.

A great deal of lucerne is utilized by grazing, especially in the newer districts, and quite profitably in many instances. However, lucerne is an erect grower, and naturally a hay type. Where lucerne is grazed, the grazing should be controlled in such a way that there is the minimum risk of harming the crowns. Pastures are composed of plants which will withstand repeated defoliations, more so than lucerne.

Lucerne, because it is a perennial species and because it possesses desirable qualities to fit it for such a role, is ideal in providing green fodder for stock in the " off season " period of annual pastures as well as supplying valuable hay for supplementary feeding.

Summer Fodder Crops

Irrigated " summer crops " are also grown for stock feed in the " off season " period for annual pastures, and in some cases, are grown in preference to lucerne. In parts of the Pyramid district, for instance, soil conditions are against the establishment of permanent lucerne, and it is in this district that most of these summer crops are encountered year after year.

Where lucerne can be established satisfactorily as an adjunct to annual pastures in particular, it should be the aim of the farmer to establish this crop. The only justification for irrigated summer crops such as Sudan grass, Japanese millet, &c., in areas suitable to lucerne, is that they are not going to become a regular feature, but merely represent a stage in the preparation of the area for lucerne.

In these two adjoining paddocks at Pyramid Hill the possibilities of improvement by culture of irrigated pastures are demonstrated.

Layout for Irrigation

All irrigated crop lands need to be laid out in a manner to allow for efficient watering. Where the crop is required to be more or less permanent, as with pastures and lucerne, the need for efficient layout is a vital one. Watering cannot be haphazard if the best results are to be achieved, so that the layout should be the best possible, and time spent in attaining a well-settled-down, evenly-graded, properly-laid-out area, will be well repaid in the resulting crop over a long period.

A prolific growth of Wimmera rye grass and subterranean clover grown under irrigation at Pyramid Hill.

Size of bay is important in water control. Optimum size of bay in most of our irrigation districts appears to approximate to 10 chains x two-thirds of a chain. In the Cobram area, because of soil types and local topography, sizes must be reduced, and often very short runs and narrow bays are necessary.

Maintenance of Production

Once having established a perennial crop of any kind, the aim must be to maintain that crop in a state of high productivity for as long as possible. The principles involved in so doing are those concerned with watering, manuring, and management.

The watering factor has been discussed above with regard to perennial pasture. As far as lucerne is concerned, best results will be obtained when it is watered to about the same extent as perennial pastures, but lucerne gives good results where waterings must necessarily be less frequent. A supplementary watering can be very helpful to lucerne in areas where water cannot be obtained when required, giving a greater absorption of water. A supplementary watering entails further irrigation a day or two after the main watering. If land was well graded in the first instance, little difficulty would be experienced in giving a supplementary watering, but if not, then troubles would only be aggravated.

Wimmera rye grass and sub. clover will be in active growth during autumn, winter, and spring, and dead during the summer months. Autumn and spring irrigations only are necessary on this class of pasture, and by this means, and by using mid-season or late strains of sub. clover, it should be possible to re-establish the pasture in early autumn, and maintain it in active growth until late spring.

Manuring is also important in maintaining productivity. Our soils require phosphates, and it has been demonstrated that these phosphates are best supplied by superphosphate. This is the best fertilizer for general farming practice, and applications of relatively large quantities have been proved to be profitable in irrigation farming. The result of topdressing is that super. encourages the growth of clovers, which in their turn build up the fertility which enables the grasses to grow in association with them, and in this way a balanced pasture is produced. Where watering is frequent, and productivity high, as with perennial pastures, it has been shown at the State Research Farm, Werribee, that a dressing of 4 cwt. super. per acre per annum had not reached the upper limit of profitable application. With annual Wimmera rye grass and sub. clover, it is recommended that a bag or 2 cwt. of super. per acre per annum be applied. For irrigated lucerne at least 2 cwt. annually is necessary.

Management of Pastures and Crops

The management of pastures and crops is a contentious subject, but important nevertheless. It concerns the manner in which the pasture or crop is utilized. Obviously with pasture it means the control of grazing. Lucerne is either grazed, or cut, or both.

A good crop of ambercane at Pyramid Hill. The man in the right background is on horseback.

Grazing management starts with rotational grazing, and entails having paddocks of suitable size and number to allow a control of the grazing within and between the paddocks. Although more information is required as to the length of rotation desirable, it seems reasonable to adopt a rotation which allows pasture to be spelled for about three weeks between grazings, and this period can be shortened during the spring flush to enable surplus growth to be conserved with perennial pasture. Winter is the "lean period", and it may be an advantage to increase the "spell period" at this time.

A point to be made concerning the management of sub. clover and rye grass, is that these pastures will be most vulnerable at seedling and seeding stages, and the stocking should be watched at such periods. At other times they are well able to look after themselves.

THE COMPETITIONS

Appin District.—The competitions at Appin were conducted by the Appin Farmers' League, and comprised pasture and lucerne entries. The inspections were made at the end of October and beginning of November, 1945. The number of entries for each competition was not large, but there were some excellent exhibits.

The pastures consisted of perennial species watered during the summer at intervals of slightly longer than a fortnight. At the time of inspection, these pastures were in nice condition.

Both pasture and lucerne competitions were judged at the one inspection.

Awards

The winner of each competition, Mr. Arthur Richardson, is secretary to the Appin Farmers' League. This competitor's farm is a model of achievement, having been taken over about seven years ago, and developed in that period from a poorly equipped property to one of the leading farms of the district.

Mr. Stedman, whose entries were placed second in both Competitions, is another progressive farmer of Appin district. This competitor is President of the Farmers' League, a dairyman, and possesses a Jersey herd of high individual and collective performance.

All entrants, and in fact farmers throughout the district, were keen to discuss their problems and their methods, and in every way to get the best out of the competitions.

Cobram District.—In the Cobram area, the Cobram Agricultural Society in conjunction with the State Rivers and Water Supply Commission, conducted the Pasture and Lucerne Competitions. The pastures consisted of Wimmera rye grass and sub. clover, and were inspected early in November, 1945. The first inspection of lucerne entries was made at the same time.

The district, as far as irrigation is concerned, is a comparatively new one, and is to be further extended. In general, the water rights are fixed on a 1 in 4 basis, except for areas formerly developed under the Cobram Irrigation Company's pumping scheme, or which have been intensively developed since the reticulation of the district.

Further expansion of the 1 in 4 area is proposed, and in addition, the State Rivers and Water Supply Commission has offered "extra water" for a contemplated "Soldier Settlement" area of approximately 60,000 acres, which would mean a water right for that region of 1¼ feet of water to 1 acre.

The most important inference to be drawn is that the present basis of water allocation in the district will be strictly adhered to in

A nice crop of millet in the northern irrigation district.

the future, and therefore, it would be very unwise for farmers situated in the 1 in 4 areas to develop a type of agriculture on their properties, which would necessitate the use of more water than they will be allowed under the distribution plan. It is considered that Wimmera rye grass–subterranean clover pasture, in conjunction with lucerne, is ideally suited to the conditions which would obtain in these parts.

AWARDS.

In the pasture competition, Mr. W. McCluskey, of Cobram, was adjudged the winner with 5 acres sown in 1940 to 3 lb. sub. clover and 5 lb. rye grass under a barley cover-crop.

The sward was in very good pasture condition, and actually was being grazed at the time of inspection. There was also a good balance between the grass and clover species. The grazing had been managed in such a way that the pasture had not suffered in uniformity from the competition aspect.

Mr. H. C. Dick, Cobram East, was placed second for an exhibit of 20 acres established in 1941. Mr. Dick was very pleased with his pasture which had enabled him to carry his stock through the recent droughty period.

Mr. C. R. Wood, of Katamatite, was third with 9 acres sown four years ago with 10 lb. rye grass and 3 lb. " Tallarook " sub. clover.

The lucerne competition was won by Mr. W. McCluskey with 7 acres sown in the spring of 1940. On the first cut this lucerne produced 295 bales, and 370 bales for the second cut. The second inspection was made just prior to the third cut.

Mr. H. C. Dick was second with 5 acres lucerne sown two years ago in autumn. Two hundred and seventy bales were obtained from the first cut. Mr. Dick has some high ground on his property well-suited to the growing of lucerne, and the installation of 7 inch and 2 inch electric pumps on the river, has enabled this area to be better utilized. The lucerne is grazed except for a period of about two months when it is shut up before the spring cut.

Mr. W. T. Buzza was third with 11 acres, first sown in the spring of 1942. Owing to the ravages of lucerne flea, half the area had to be resown the following year. Mr. Buzza is an experienced lucerne grower.

Pyramid Hill.—The Pyramid Hill and District Agricultural Society again held its annual competition for pastures and summer crops in the 1945–46 season. The pastures were inspected in mid-November, 1945, and the summer crops in February, 1946. The judging of the summer fodders was undertaken in association with Mr. J. A. Aird, Chief Irrigation Officer of the State Rivers and Water Supply Commission, and will be the subject of a separate report to be published in a subsequent issue of this Journal.

AWARDS.

Messrs. C. E. Woods and Sons gained first prize with an excellent 15 acres of Wimmera rye grass and sub. clover. The paddock was sown in 1931, and has never

Vigorous growth is indicated in the size of these sub. clover leaves taken from a pasture on the property of Messrs. C. E. Woods & Sons, Pyramid Hill.

been artificially re-seeded since. The seeding at time of sowing was 3 lb. of sub. clover and 7 lb. Wimmera rye grass per acre.

Mr. M. Cassidy was judged a close second in the Competition, for a similar 12 acres of pasture sown in 1943, to 4 lb. sub. clover and 10 lb. rye grass under a barley cover-crop. The paddock was cut in 1944, and has been used for grazing since that date.

Appin District

Pasture Competition Awards.

Competitor.	Layout.	Condition of Herbage.	Uniformity.	Mixture.	Absence of Weeds.	Total.
Maximum Points	20	20	20	20	20	100
1. Richardson, A. (No. 1 entry)	17	17	18	18	17	87
2. Stedman (No. 1 entry)	17	16	17	18	17	85
3. Richardson (No. 2 entry)	16	16	17	18	17	84
4. Stedman (No. 2 entry)	14	15	17	16	15	77

Lucerne Competition Awards.

Competitor.	Layout for Irirgation.	Condition.	Uniformity.	Apparent Yield.	Freedom from Weeds.	Total.
Maximum Points	20	20	20	20	20	100
1. Richardson (No. 2 entry)	17	17	16	17	15	82
2. Richardson (No. 1 entry)	17	15	17	17	14	80
3. Stedman	13	15	14	17	14	73
4. Higgie	14	12	14	14	16	70
5. Teasdale, W.*	17	..	..	16	..	..
6. Tesdale, N.†	16	..	..	..	..	..

* Crop cut at time of inspection.
† Crop in seedling stage.

Cobram District

Pasture Competition Awards.

Competitor.	Layout.	Condition.	Uniformity.	Mixture.	Freedom from Weeds.	Total.
Maximum Points	20	20	20	20	20	100
1. McCluskey	18	18	18	18	17	89
2. Craig, Dick	17	17	17	17	17	85
3. Wood	16	17	17	17	17	84
4. Smith (Snr.)	16	17	17	17	16	83
5. Buzza	15	17	16	17	16	81
6. Fairley	16	15	14	16	14	75
7. Murch	15	14	16	13	15	73
8. Gemmell	18	11	15	10	16	70
9. Bassett-Smith	10	15	14	15	12	66
10. Harris	13	12	15	13	13	66

Cobram District (continued)

Lucerne Competition Awards.

Competitor.	Layout.	Apparent Yield.	Uniformity.	Condition.	Freedom from Weeds.	Total.
Maximum Points	20	20	20	20	20	100
McCluskey	17	17	16	17	16	83
Craig, Dick	18	17	15	15	16	81
Buzza	17	15	13	14	17	76
‡Morris	19	13	14	14	14	74
Smith (Snr.)	14	15	14	14	16	73
Ritchie	14	14	14	14	16	72
Harris	15	15	12	11	16	69
*Smith (Jnr.)	18	9	9	9	9	54
*Bassett-Smith	17	8	8	8	9	50
*Wood	18	6	8	9	9	50
†Davey	15	7	8	9	9	48
*Fairley	17	7	6	7	8	45

* At second inspection lucerne cut or completely grazed off.
† Lucerne in seedling stage at first inspection and cover crop just cut.
‡ "Baby" lucerne at first inspection.

Pyramid Hill District

Pasture Competition Awards.

Competitor.	Layout.	Condition.	Uniformity.	Mixture.	Freedom from Weeds.	Total.
Maximum Points	20	20	20	20	20	100
Woods, C. E. and Sons	14	17	18	17	18	84
Cassidy, M.	15	16	18	16	18	83
Mills, R. H.	14	16	17	17	10	74
Miles, A. (No. 1)	12	13	15	16	18	74
Miles, A. (No. 2)	12	13	14	15	16	70
Spowart, S.	13	13	13	13	12	64
Mills, C.	13	11	14	12	14	64

IN THE ORCHARD

Frost Damage to Fruit Trees

By G. W. GAYFORD, B. Agr. Sc., Horticultural Instructor

SEVERE frost damage has occurred in various fruit-growing areas throughout Victoria during the past few years, damage in citrus areas being particularly severe. Young trees have been most severely affected and, in some cases, were killed outright. Of citrus trees generally, lemon trees appear to be the most susceptible to damage.

Frost heaters, briquette type, distributed in a lemon grove.

Deciduous fruit trees have also been damaged by spring frosts, and crops of apricots, plums and peaches in the Horsham district have been considerably reduced during the past three years. The light crop of plums in the Wandin–Silvan district last season was due to late frosts.

The period during which deciduous fruits are liable to frost damage is from the start of blossoming until the fruit has developed to about ½ inch in diameter, the most susceptible period occurring just after the fruit has set. For deciduous trees, late August, September and early October are the critical months.

The past three winters have been particularly dry in most parts of the State, with the result that frosts have been fairly severe. Many growers have suffered severe losses and, for this reason, some brief notes on the subject of possible control measures are provided for those who may be seeking some way of preventing or at least reducing losses.

The cause of frost damage is well enough known. Heat which is stored up in the soil and plants during the daylight hours is rapidly radiated into the atmosphere on still, cloudless nights. The lower layers of the atmosphere become chilled and on sloping ground, the chilled air, increasing in density, moves to the lowest situation. For this reason low-lying situations become pockets for cold air where frost will be more severe. As the temperature falls, formation of ice crystals occurs within the plant. This results in a breakdown of the interior of the cells and subsequent death of the affected part of the plant.

Control Methods

Any attempt at frost control must be aimed at preventing the temperature from falling low enough to freeze the plant

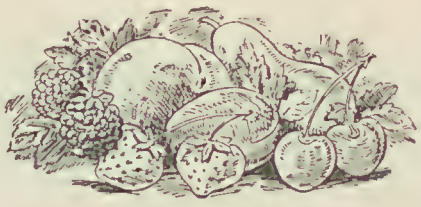
tissues. The two main methods are either to prevent radiation heat losses or add some form of heat. Both methods involve a fair amount of expense.

Prevention of radiation by the formation of smoke screens from smudge fires has been tried in many parts of the world, but the general conclusion seems to be that this method cannot be expected to hold the temperature more than 2 or 3 degrees above that of adjacent unprotected areas. This would be insufficient protection in a severe frost. There seems to be some basis for the theory that trees on fairly dry soil are more susceptible to damage than those surrounded by wet soil. This is due to the fact that, in a wet soil, there is a more rapid transfer of heat from the lower soil layers to replace heat lost at the surface. In a dry soil, which is a poor heat conductor, heat transference is slow. For this reason, irrigation is sometimes applied before an anticipated frost. It is not known to what extent this method will prevent damage in a severe frost, and there is some risk that waterlogging and consequent root damage may occur through winter irrigation.

Various methods to heat the lower layers of the atmosphere include the use of wind machines and direct heaters. Wind machines consist of a large aeroplane-type propeller and power unit mounted on a tower about 50 feet above soil level. The unit slowly rotates and is designed to mix the cold ground level air with warmer air from higher levels. This method does not appear to be completely effective, judging by Californian experience with such equipment.

The most reliable method available at the present time seems to be the direct heating of the air by distributing a large number of small heater units through the area to be protected. There is usually a "ceiling" of warm air above a frosted area at a height which varies from 30 to 500 feet. To be effective the heaters must maintain the layer of air from ground level to the "ceiling" above the danger point. For a high ceiling, a large quantity of heat must be generated to be effective. Although this method of direct heating is well established for the protection of citrus in California, there are difficulties in the way of its successful use in Victoria. Expense is the main item. About 60 heaters per acre are required, each costing from 3s. 6d. for 5-quart capacity to 5s. 6d. for 3-gallon capacity containers. Alarm thermometers with wiring, &c., would cost about £5 each. The alarm thermometers are usually set to ring at 34° F., but considerable experience with temperatures is required before it can be definitely decided that it would be worthwhile lighting up. Fuel oil is expensive and at the present time the cost of two firings of four hours each on an acre of orchard would cost about £10, including labour and depreciation. In a particularly severe frost there is no guarantee that the heaters will be able to maintain the temperature above the danger point.

Orchard heaters have been tried in this State and further investigations are to be conducted. Although the past seasons have seen extensive losses due to frost damage, these have been abnormal and a study of damaging temperatures over a period of years may reveal that the expense of installation and maintenance of frost equipment is not economic in certain areas.



THE FLOWER GARDEN

ASPECT AND POSITION

By T. H. KNEEN, B.Agr.Sc., Acting Principal, School of Horticulture, Burnley

ONE of the most common causes of failure in growing plants and shrubs successfully in the average home garden is that too much consideration is given to soils and fertilizer and little or none to aspect and position. Soil conditions are important, but it is well to remember that no matter how good the soil is, if the position is bad, disappointment is certain to follow.

One of the most difficult situations for a garden is between the wall of a house and a paling fence, especially if it happens to be on the south side. In addition to being shady, such a position will act as a funnel for cold west winds, and few plants will thrive under such conditions. One of the first things to do in such a case, is to place a trellis across the west end to stop the cold blast of air. Similarly, a position exposed to hot north winds should be closed. It is then time to start thinking about improving the soil. Fuchsias can be grown and trained on the fence and there is no better variety for this purpose than E. G. Hill, a fuchsia with red sepals and white corolla—and there are also many other varieties to choose from. Fuchsias in such a position will tend to run to the top of the fence to bloom, but under, and in front of them, such subjects as Helleborus, Primroses, Azaleas (if sufficient room is available), Lily of the Valley, and perhaps Aquilegias may be grown.

There are two general groups of shrubs which require special positions. In the first group are Hydrangeas, Rhododendrons, Azaleas, Andromedas, Kalmias, Luculia, &c. All of these require to be sheltered from the hot sun and scorching wind. In the other group are Hibiscus, Bouvardias, Gardenias, Rondeletia amoena, and climbers such as Thunbergia and some of the more tender Bougainvilleas. These plants need all the sun and warmth they can get, and do not thrive under cold and frosty conditions.

In selecting positions for the first group of plants it is a mistake to think that any place, so long as it is shady, will do. All of these plants need shelter, but plenty of light and air as well. Many failures of Hydrangeas to bloom well are due to the fact that they have been placed under dense evergreen trees where they are in perpetual shade. The same could be said of Rhododendrons and Azaleas grown under such conditions. These plants will bloom less freely and be more subject to red spider attack unless allowed plenty of light and air. At the same time, full shelter from the hot sun and north winds must be provided. If aspect and position are not given full consideration, the purchase of mountain soil, the importance of which is probably over-rated, will be wasted.

The ideal position for members of the second group of plants mentioned is against a north wall with an overhanging eave, provided protection from wind is given. In such a position they will get the maximum amount of sun, and at the same time be sheltered from frosts. Sometimes these plants can be established on the north side of trees, but the difficulty here is that they will come into competition with the roots of the trees which provide their shelter.

The average garden soil, with ordinary care and treatment, will grow a wide range of plants, but unless aspect and position are carefully studied, a good deal of time, energy and hard cash will be wasted.

The VEGETABLE GARDEN

Peas and Broad Beans

EARLY crops of peas may be secured by planting the Greenfeast variety this month in soil well-drained and not subject to water-logging. Planted now, they will reach the flowering and podding stage after the period in which frosts usually occur. The plants will grow rather slowly, and may take up to 21 weeks to mature instead of the more normal 12 to 16 weeks in warmer weather. They can be picked over for about 3 weeks, and therefore, monthly sowings are advisable if a continuous supply is to be maintained.

Peas respond to superphosphate, which should be applied at the rate of one ounce to each three yards of furrow. This dressing should not come in contact with the seeds, but should be worked into the furrow before sowing. A good plan is to place the fertilizer at a depth of two inches, and about three inches to each side of the row.

Late sowings of Broad beans may be made this month, and many people find that this late crop produces quite as heavily and almost as early as the earlier-sown crops, particularly if early spring weather is cold and wet. In addition, the disease known as "Bean Rust" is frequently less troublesome in a late crop. Young pods of Broad beans can be used for the kitchen in the same way as French beans, thus extending the harvesting season.

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Cabbages

July and August are good months for transplanting seedlings of the Parisian variety. Cabbages thrive in soil that has been treated with a heavy dressing of well rotted organic manure, and they also benefit during growth with side dressings of nitrogenous fertilizers such as sulphate of ammonia—half an ounce per square yard two or three times during the growing period. Continuous rapid growth is essential for this crop.

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Potatoes

A crop of early potatoes is well worth while for home gardeners with the space available. Two rows each of a dozen plants established late in July will provide a welcome supply of new potatoes from the latter part of October. The crop will mature in December, and will of course be available for use after digging for another two or three months according to the size of the family.

The most suitable early variety is Carman No. 1, which may be sown this month. Early potatoes will do especially well in the light acid soils of the coastal areas around Melbourne. Lime should not be used in preparing the ground, as this increases the incidence of scab. Before planting, expose the tubers to light in an airy shed until the skins become green. Use medium sized potatoes for "seed" and cut into pieces about 1½ inches in diameter, each piece with 2 to 3 "eyes". Observations in a home garden last season confirmed the value of "seed" selection—in one row of twelve small whole tubers used as unselected seed, one-third of the plants were affected with virus disease, and the production of that row was much reduced when compared with a similar row of selected seed in which only one plant developed virus. Production from the selected row was, in fact, 50 per cent. greater than from the unselected row.

Preserves for Diabetic Patients

SOME USEFUL RECIPES

By RUTH BROMFIELD, *Fruit Preserving Expert*

SOME people are unable to assimilate jams and bottled fruits because of the sugar used for sweetening. They either do without or use some of the commercial lines specially prepared for diabetic patients. Housewives who have to cater for such a member of the family are often unaware that sugar is not necessary to make a preserve that is palatable and acceptable to a sufferer from diabetes. Quite attractive jams and bottled fruits may be prepared by using various substitutes for sweetening such as saccharine and glycerine, and some recipes containing these ingredients are set out in the following article.

Glycerine is undoubtedly the most satisfactory substitute for sugar, and a preserve made from it should keep quite well. It is advisable however to store the jams in small containers because once opened they will not keep as well as jams made with sugar.

General Method.

Prepare and weigh the fruit, cook until it is softened, and during the process add sufficient water to prevent it from burning. Then add saccharine to taste (about thirty 0.3 grain tablets to 3 lb. fruit) and 2 pints glycerine. Boil the jam until it thickens, pour into sterilized jars and seal immediately.

When glycerine is not used, gelatine can be used to form a "gel," although the flavour is not usually as good as that obtained with glycerine. When gelatine is added, small jars which can be sterilized and hermetically sealed should be used, because the product will keep only for a few days when opened.

Recipes.

Apricot.

3 lb. apricots.
1 quart glycerine.
30 saccharine tablets (0.3 gr.).
½ pint water.

Cook the apricots and water until the fruit is softened. A few blanched kernels may be included. Add the saccharine tablets and glycerine and boil until the jam thickens. Pour into sterilized jars and seal.

Plum.

3 lb. plums.
1½ oz. powdered gelatine.
30 saccharine tablets (0.3 gr.).
1 pint water.

Cook the fruit in ½ pint water until it is soft and the pulp thickens. Add saccharine tablets. Dissolve the gelatine in ½ pint boiling water. Add this to the pulp and mix thoroughly while the mixture is kept gently boiling. Pour into hot preserving jars, put on the covers at once and sterilize by placing the jars on a rack in a pan, covering with hot water, bringing the water to the boil and boiling for five minutes.

Raspberry.

3 lb. raspberries.
1 quart glycerine.
30 saccharine tablets.

Gently heat the raspberries, dissolve the saccharine tablets in the fruit and add the glycerine. Boil until the jam thickens pour into jars and cover as for other jams.

Bottled Fruit

It is not necessary to preserve fruit in a sugar syrup for it to keep. It may be bottled in water (previously boiled and

cooled) and then sweetened with saccharine at the time of serving. To do this, the fruit should be removed from the bottle, transferred to a pan and brought to boiling point. Then add sufficient saccharine to sweeten. After the saccharine is added the fruit should not be permitted to reach boiling point again, because a slight bitterness will result.

Glycerine Syrup.

The syrup is made by dissolving the glycerine in boiling water. One cup of glycerine to 2 cups of water makes a syrup sufficiently sweet for most palates. Follow the usual method of bottling fruit.

Sugarless Marmalade

4 large Seville or Poorman oranges or grapefruit.
3 pints water.
20 saccharine tablets.
1 pint glycerine.

Weigh the pan before adding ingredients. Shred the peel, put the pith and pips in muslin. Simmer the peel and the fruit in the water for about 1½ hours or until the peel is softened. Remove the bag of pith after squeezing out the juice. Reduce the remainder of the pulp to about 2 lb, add the glycerine and saccharine and boil until the marmalade thickens. The whole quantity should then weigh about 2½ lb.

BOOKS REVIEWED

Principles and Methods of Animal Breeding, by R. B. Kelley, D.V.Sc., Animal Geneticist, Council for Scientific and Industrial Research; Officer-in-Charge, the F. D. McMaster Field Station; President, N.S.W. Working Sheep Dog Society: Angus and Robertson Ltd., Sydney–London, 1946, 15s. nett.

This book is another contribution towards the explanation of the very complex mechanism of inheritance and breeding. In actual fact, the book is a publication of the lectures which Dr. Kelley has given to the Veterinary Students at the University of Sydney.

The history of animal breeding and genetics is outlined together with chapters on the development of a number of breeds of live stock, Mendelism, modern applied breeding methods, artificial insemination, progeny testing, and present research in Australia.

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Sussex Cattle by E. Walford Lloyd, published by Sussex Express and Country Herald Ltd., High-street, Lewes, on behalf of the Sussex Herd Book Society: Robertson and Mullens Ltd., Melbourne, 16s.

Sussex cattle have inhabited the Weald of Sussex and Kent from time immemorial. Originally they were bred for cultivating the fields and transporting produce from the farms and firewood and timber from the forests. With the development of roads the Sussex oxen gave way to horses, and more recently to mechanical traction. This led to a greater concentration on the splendid meat-producing capabilities of the breed.

About 1795, the noted agricultural journalist, Rev. Arthur Young, reported fully on Sussex cattle and stated that "Perhaps the largest Sussex ox known in the breed was that bred at Burton Park, which was 16½ hands high, 10 ft. girth behind the shoulders, and scaled 287 stone 4 lb."

Among other things, the book describes the history of the breed, some of the leading studs, methods of management, the suitability of Sussex cattle for different climatic conditions and their results at fat stock shows.

It is interesting to note that after the Napoleonic wars, one of the early Sussex breeders wrote that "—the price of wheat went back after the wars; our farmers had parted with their cattle, their chief asset, and gradually dwindled and disappeared as misfortune overtook them when cultivation of this stiff land became unprofitable"—One can imagine the pleasure it would have given the writer had he lived to see the great revival of this ancient breed of cattle which is taking place today. The Sussex Herd Book Society was formed in 1878.

This book should be of great interest to all Victorian beef producers.

LIST OF STOCK FOODS AND STOCK LICKS

REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE STOCK FOODS ACT 1936 (No. 4382) FOR THE YEAR 1946.

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Where Obtainable.
CONCENTRATED STOCK FOODS.	%	%	%	
* *Feeding Blood Meal.*				
M.C.C. Poultry Blood Meal	75·0	1·0	5·0	Melbourne City Council, Town Hall, Melbourne
Imperial	85·0	..	5·0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Pannifex's	75·0	2·0	5·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Champion	75·0	..	5·0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Brooklyn T. B. and S. in diamond	75·0	1·5	1·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Portland T. B. and S. in diamond	75·0	1·5	1·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
V.I.M.A. over B.A.	80·0	..	1·5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
† *Feeding Meat Meal.*				
M.C.C. (with bone)	57·0	10·0	5·0	Melbourne City Council, Town Hall, Melbourne
Imperial Meat Meal	60·0	10·0	2·0	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Imperial Liver Meal	65·0	18·0	..	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Pannifex	55·0	5·0	3·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
V.I.M.A.	55·0	13·0	1·5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
‡ *Feeding Meat and Bone Meal*				
Apex	45·0	10·0	3·0	North-Eastern Bone Products, Wangaratta
V.I.M.A.	45·0	12·0	1·5	Victorian Inland Meat Authority, 54 Market-street, Melbourne
Mercury	50·0	12·0	1·5	H. C. Sleigh, 582 Little Collins-street, Melbourne
Pannifex	45·0	8·0	3·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Imperial Bovina	47·0	8·0	1·0	Wm. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
Calphoric	45·0	15·0	2·5	Mulgrave By-Products Co., North-road, East Oakleigh
Champion	50·0	12·0	5·0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Pioneer, No. 2	45·0	10·0	2·0	J. Cockbill, Footscray-road, Footscray
T.B. and S. in diamond Brooklyn	50·0	12·0	4·0	Thos. Borthwick and Sons (A/asia) Ltd., 84 William-street, Melbourne
Dandy	45·0	12·0	1·66	Gippsland Co-op. Bacon Curing Co. Ltd., Dandenong
Pridhams	45·0	12·0	1·0	W. Pridham Pty. Ltd., Evans-street, Braybrook
Bone and Meat Meal.				
Apollo	40·0	8·0	1·5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
J.K.S.	40·0	10·0	2·5	J. Kitchen and Sons Pty. Ltd., Ingles-street, Port Melbourne
Trident	40·0	15·0	5·0	Sims Cooper Freezing Works Pty. Ltd., 31 Queen-street, Melbourne
Pannifex	40·0	5·0	5·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Milk Products.				
Krafco (Dried Whey)	10·0	0·5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Kraftone (Dried Whey)	10·0	0·5	..	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne
Maffco Buttermilk Powder	30·0	5·0	..	Maffra Co-op. Milk Products Co. Ltd., Maffra
K.B.F. Buttermilk Powder	30·0	6·0	..	Korumburra and District Co-op. Butter Factory and Trading Co. Ltd., Korumburra
Allansford Buttermilk Powder	30·3	7·0	..	Warrnambool Cheese and Butter Factory Co. Ltd., Allansford
Longbar Whey Powder	11·0	0·5	..	Alfred Barrow Pty. Ltd., 47 King-street, Melbourne
Milway Milk Product	20·0	18·0	1·5	Kraft Walker Cheese Co. Pty. Ltd., Riverside-avenue, South Melbourne

* Standard not less than 75 per cent. crude protein and not more than 5 per cent. crude fibre.
† Standard not less than 55 per cent. crude protein and not more than 7 per cent. phosphoric acid. 100 per cent. must pass through a 10-mesh sieve.
‡ Standard not less than 45 per cent. crude protein. 100 per cent. must pass through a 10-mesh sieve.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
CONCENTRATED STOCK FOODS—*continued.*	%	%	%	
Oil-Seed or Cake Meals and Nuts.				
Rta Peanut Meal	49·0	7·0	6·0	Nut Foods Pty. Ltd., 271–277 Grant-street, South Melbourne
Meggitt's Linseed Oil-cake Meal	30·0	6·0	10·0	Meggitt Ltd., Hobson's-road, South Kensington
Meggitt's Linseed Sheep Nuts	30·0	6·0	10·0	Meggitt Ltd., Hobson's-road, South Kensington
Sunlight Oil-cake	20·0	5·5	6·5	Lever Bros. Pty. Ltd., 567 Spencer-street, Melbourne
Key Meal	20·0	5·5	6·5	Lever Bros. Pty. Ltd., 567 Spencer-street, Melbourne
§Levers Peanut Cake	45·0	5·5	5·0	Lever Bros. Pty. Ltd., 567 Spencer-street, Melbourne
MIXED STOCK FOODS.				
For Pigs.				
Barastoc Pig Cubes	15·0	3·0	6·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Topping-off Pig Cubes	12·5	3·0	6·0	Barastoc Products, 395 Collins-street, Melbourne
Osmond's Codlivine (Pigs)	19·0	14·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Clark's Pig Starter	17·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Gro-Pig	16·0	3·0	4·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Cohana Pig Meal	15·0	2·0	7·0	Cohana Stockfood Co., Williamstown
For Calves.				
Harpers Star Calf Food	11·5	12·5	7·0	Robert Harper and Co. Ltd., 390 Flinders-lane Melbourne
*Parsons Calf Food	12·0	2·0	6·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Excello Calf Food	11·0	4·0	3·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Ayrshire Calf Food	13·35	2·49	3·14	James Railton, 133 Elizabeth-street, Melbourne
Ward's Calf Food	9·0	3·0	7·0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Vetamac Calf Food	20·23	13·13	5·75	A. H. McDonald and Co. Pty. Ltd., 627 Bridge-road, Richmond
Velox Calf Food	14·6	2·9	4·0	H. C. Allen, Newcombe-street, Portarlington
Gro-calf No. 2	20·0	4·0	4·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Kaf-o-vite Calf Food	16·5	9·5	7·5	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Barastoc Calf Pellets	18·0	4·0	6·5	Barastoc Products, 395 Collins-street, Melbourne
Federal	20·4	8·2	5·1	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
For Dairy Cows.				
Lambert's Dairy Mixture No. 3	15·0	5·0	8·0	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Barastoc Dairy Cow Cubes No. 2	15·0	3·5	9·5	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Dairy Cow Meal No. 2	15·0	3·5	9·5	Barastoc Products, 395 Collins-street, Melbourne
Mormilk No. 2	20·0	4·75	14·0	H. C. Pannifex and Co. Pty. Ltd., 53–57 Munster-terrace, North Melbourne
Clark's Dairy-Mex No. 2	18·0	3·0	8·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
† Vetamac Medicated Dairy Meal	10·0	2·5	5·0	A. H. McDonald and Co. Pty. Ltd., 627 Bridge-road, Richmond
Cohana Blended Cow Food	12·0	2·5	7·0	Cohana Stockfood Co., Williamstown
* Parsons Dairy Cow Meal	17·0	3·5	17·0	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
General.				
Osmond's Codlivine	20·0	14·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Cowlings Proteinized Ground Wheat	13·0	2·5	6·0	W. Cowling, Market Square, Bendigo
Maffco Stock and Poultry Mix	13·75	1·98	1·67	Maffra Co-op. Milk Products Co. Ltd., Maffra
Purity Stock Meal	15·0	3·0	5·0	Wise Bros. Pty. Ltd., Tocumwal
Poultry Foods.				
Harper's Star Chick Flakes	9·0	9·0	5·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star Chick Food	9·0	9·5	5·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Prepared Grain	8·5	9·0	4·5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Clark's Laymor	17·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne

§ Contains 1 per cent. salt. * Contains 1 per cent. salt. † Contains 23·0 per cent. salt.

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
MIXED STOCK FOODS—*continued.*	%	%	%	
Poultry Foods.				
Clark's Gro-chick	16·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Eggoleen No. 2	40·0	10·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Chick-starter	17·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Turkey Starter	18·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Breeders' Mash	16·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Clark's Fattening Mash	15·0	4·0	6·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Warragul Laying Mash	14·05	4·5	4·2	Warragul Egg Circle, Warragul
Warragul Growing Mash	14·07	5·9	5·2	Warragul Egg Circle, Warragul
Cowling's Laying Mash	14·0	2·5	7·0	W. Cowling, Market Square, Bendigo
Cowling's Chick Mixture	10·0	1·25	3·0	W. Cowling, Market Square, Bendigo
Cowling's Chick Starter	15·5	3·0	5·0	W. Cowling, Market Square, Bendigo
Cowling's Growing Grain	12·0	1·5	4·0	W. Cowling, Market Square, Bendigo
Barastoc Poultry Pellets W (Layers)	17·0	4·5	7·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Chick Pellets	16·0	4·5	6·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Grower's Pellets A	15·0	4·0	7·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Pellets W (Growers)	15·0	4·0	7·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Poultry Layers' Pellets	17·0	4·5	7·0	Barastoc Products, 395 Collins-street, Melbourne
Barastoc Duck Fattening Pellets	15·0	3·0	6·0	Barastoc Products, 395 Collins-street, Melbourne
Ward's Chick Meal	10·0	4·0	5·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Osmond's Codlivine for Poultry	19·0	12·0	9·0	Osmond and Sons (Aust.) Pty. Ltd., 35 William-street, Melbourne
Excello Growing Mash	9·0	3·4	7·0	Lyall and Sons Pty. Ltd., 39–51 Leveson-street, North Melbourne
Excello Laying Mash	13·0	4·0	7·0	Lyall and Sons Pty. Ltd., 39–51 Leveson-street, North Melbourne
Clark's Vitamilk	31·0	6·0	1·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Mercury Poultry Food Concentrate	29·0	5·0	2·0	H. C. Sleigh, 582 Little Collins-street, Melbourne
Lambert's Chicken Starter	17·0	4·0	6·0	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Lambert's Laying Mash	17·0	4·0	6·0	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Rumble and Son Top Scorer	14·7	4·7	3·4	F. Rumble and Son, Pt. Nepean-road, Moorabbin,
Cohana Blended Poultry Food	15·0	2·5	4·5	Cohana Stockfood Co., Williamstown
Burrow's Poultry Laying Mash	16·0	4·0	9·0	John Burrows Pty. Ltd., Albury, N.S.W.
A.B.C. Growing Mash	14·0	4·0	5·3	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street North Melbourne
A.B.C. Laying Mash	16·0	3·5	7·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Werribee Mash	11·0	3·5	4·5	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Marvel Chick Meal	9·0	3·0	5·0	J. McBeth, 207 Neerim-road, Carnegie
Marvel Laying Mash	15·0	2·4	6·0	J. McBeth, 207 Neerim-road, Carnegie
Par-Meal Laying Mash	15·0	4·25	5·5	Parsons Bros. and Co. Pty. Ltd., 554 Flinders-lane, Melbourne
Master Mix Mash	15·0	3·4	5·0	Northern Seed Supply Co., Market Square, Bendigo
Bush's Laying Mash	14·9	3·9	7·2	Albert Bush Produce Stores, Bendigo
Bush's Chick Mash	15·4	3·6	6·9	Albert Bush Produce Stores, Bendigo
McColl & Buzza's Laying Mash	14·0	4·5	4·2	McColl & Buzza Pty. Ltd., 865 Dandenong-road, Caulfield East
WHEAT AND WHEAT BY-PRODUCTS.				
Lyall's Wheat Meal	9·0	3·0	4·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Clark's Wheat Meal	9·0	1·0	3·0	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Pratt's Ground Wheat	9·5	1·5	3·5	David Pratt and Sons, Mair-street, Ballarat
Connell's Wheat Polishings No. 1	14·0	4·0	3·5	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Connell's Wheat Polishings No. 2	13·5	5·0	9·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Maryborough Crushed Wheat	9·5	2·0	2·5	Maryborough Flour Mills Pty. Ltd., Maryborough
Wangarratta Crushed Wheat	9·5	2·0	2·5	Wangarratta Flour Mills Co. Pty. Ltd., Wangarrata
Water and Kerang Ground Wheat	9·5	1·5	2·5	Water and Kerang United Roller Mills Ltd., Kerang and Bridgewater
Darling's Wheat Meal	10·5	2·5	3·5	John Darling and Son, 44 King-street, Melbourne
Garden City Gristed Wheat	9·1	2·1	2·1	Garden City Flour Milling Co. Pty. Ltd., Ballarat
Kimpton's Crushed Wheat	8·5	1·5	3·0	W. S. Kimpton and Sons, 395 Collins-street, Melbourne
McLennan's Wheat Meal	8·5	1·5	3·0	McLennan and Co. Pty. Ltd., Mooroopna
Willis' Wheat Stock Feed	9·5	2·0	3·0	Willis Bros., Kyneton
Minific's Ground Wheat	9·5	1·5	3·0	Jas. Minifie and Co., 422 Collins-street, Melbourne
Echuca Crushed Wheat	9·5	2·0	2·5	Echuca Flour Mills Pty. Ltd., Echuca
Wimmera Crushed Wheat	9·5	2·0	2·5	Wimmera Flour Mill Co. Pty Ltd., Stawell
Stratton's Wheat Meal	9·5	2·0	3·0	Stratton and Co. Pty. Ltd., 68 Lulie-street, Abbotsford
Cowling's Ground Wheat	9·5	2·0	2·5	W. Cowling, Market Square, Bendigo
Malcolm's Crushed Wheat	9·5	2·0	2·5	James Malcolm and Co. Pty. Ltd., St. Arnaud

Distinguishing Brand Name.	Guaranteed Composition. Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	Where Obtainable.
WHEAT AND BY-PRODUCTS—*continued*	%	%	%	
Noske Bros. Crushed Wheat	9·5	2·0	2·5	Noske Bros. Pty. Ltd., 108 Queen-street, Melbourne
Schutt and Barrie Wheat Stock Meal	9·5	2·0	2·5	Schutt and Barrie Flour Mills Pty. Ltd., Geelong-road, West Footscray
Thomas' Crushed Wheat	9·5	2·0	2·5	W. C. Thomas and Sons Pty. Ltd., 55 William-street, Melbourne
Burnley Crushed Wheat	9·5	2·0	2·5	Burnley Flour Mills Pty. Ltd., 376 Swan-street, Burnley
Hutchinson's Wheat Meal	9·5	2·0	2·5	Hutchinson's Finley Flour Milling and Agency Co. Pty. Ltd., Glenroy
John Burrows Wheat Stock Meal	9·0	2·0	3·5	John Burrows Pty. Ltd., Albury, N.S.W.
Lambert's Wheat Meal	9·5	2·0	2·5	T. H. A. Lambert Pty. Ltd., 696 High-street, Kew
Williams Rolled Wheat	9·5	2·0	2·5	Henry E. Williams and Son Pty. Ltd., 9 High-street, Maryborough
Parson's Wheat Polishings	13·5	3·75	5·5	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Harper's Wheat Polishings	11·5	2·5	15·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Moregrain Wheat Meal	9·5	1·5	2·5	Norris and Wilkinson, Tinning-street, Brunswick
Williams Rolled Wheat Meal	9·5	1·5	3·0	Henry E. Williams and Sons Pty. Ltd., Maryborough
Marvel Wheat Meal	9·5	2·0	3·5	J. McBeth, 207 Neerim-road, Carnegie
A.B.C. Wheat Meal	9·0	3·0	4·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Grant and Wilson Crushed Wheat	8·5	1·5	3·0	Grant and Wilson, Yarrawonga
Evans Crushed Wheat	9·5	1·5	3·0	Evans Grain and Produce Co., Benalla
Swan Crushed Wheat	8·5	1·5	2·5	Swan Milling Co., Swan Hill
Jackett Crushed Wheat	8·5	1·5	2·5	Howard Jackett and Co. Pty. Ltd., 534 Bridge-road, Richmond
Tomlins Simmie Ground Wheat	9·5	2·0	2·5	Tomlins, Simmie and Co., Bendigo
Lanray Wheatmeal Flour	10·0	2·0	3·0	Lanray Milling Co. Pty. Ltd., 118 Queen-street, Melbourne
Lanray Wheat Polishings	12·0	4·0	7·0	Lanray Milling Co. Pty. Ltd., 118 Queen-street, Melbourne
Bransum Wheat Flakes	10·0	2·0	3·5	Cromarty Animal Food Mill, Springvale-road, Springvale South
Polplus Wheat Semolina	9·0	2·0	2·0	Cromarty Animal Food Mill, Springvale-road, Springvale South
Cromarty Rolled Wheat No. 1	8·5	1·5	2·5	Cromarty Animal Food Mill, Springvale-road, Springvale South
Bush's Crushed Wheat	9·5	2·0	2·5	Albert Bush Produce Stores, Bendigo
Bush's Ground Wheat	9·5	2·0	2·5	Albert Bush Produce Stores, Bendigo
BRAN AND POLLARD.				
The following firms have registered distinguishing brand names for Bran† and Pollard‡ :—				
T. Brunton and Co. Pty. Ltd.	..	..	..	531 Collins-street, Melbourne, and Rupanyup
Burnley Flour Mills Pty. Ltd.	..	..	..	376 Swan-street, Burnley
Darling (John) and Son	..	..	..	44 King-street, Melbourne
Echuca Flour Mills Pty. Ltd.	..	..	..	Echuca
Garden City Flour Milling Co. Pty. Ltd.	..	..	..	Trench-street, Ballarat
Grant and Wilson Pty. Ltd.	..	..	..	McNally-street, Yarrawonga
Kimpton (W. S.) and Sons	..	..	..	395 Collins-street, Melbourne
Malcolm (James) and Co. Pty. Ltd.	..	..	..	St. Arnaud
Maryborough Flour Mills Pty. Ltd.	..	..	..	Maryborough
McLennan and Co. Pty. Ltd.	..	..	..	Mooroopna
Miniie (James) and Co.	..	..	..	422 Collins-street, Melbourne
Noske Bros. Pty. Ltd.	..	..	..	108 Queen-street, Melbourne, Horsham, Nhill, and Charlton
Schutt and Barrie Flour Mills Pty. Ltd.	..	..	..	Geelong-road, West Footscray
Silver Lake Flour Mill Pty. Ltd.	..	..	..	Sale
Smith (W. and P.)	..	..	..	35 Cusack-street, Wangaratta
Stratton and Co. Pty. Ltd.	..	..	..	68 Lulie-street, Abbotsford
Swan Milling Co.	..	..	..	Swan Hill and 1 Bent Street, Northcote
Sunraysia Flour Mills Pty. Ltd.	..	..	..	Mildura
Thomas (W. C.) and Sons Pty. Ltd.	..	..	..	55 William-street, Melbourne
Tomlins, Simmie and Co. Pty. Ltd.	..	..	..	Bendigo and Richmond
Wangaratta Flour Mills Co. Pty. Ltd.	..	..	..	Wangaratta and Wahgunyah
Willis Bros.	..	..	..	Kyneton
Wimmera Flour Mill Co. Pty. Ltd.	..	..	..	Stawell
Water and Kerang United Roller Mills Ltd.	..	..	..	14 Collins-street, Melbourne
Wise Bros.	..	..	..	Tocumwal
Howard Jackett and Co. Pty. Ltd.	..	..	..	534 Bridge-road, Richmond
Hudson and Co. Pty. Ltd. (Bran only)	..	..	..	631–5 Church-street, Richmond
Hutchinson's Finley Flour Milling and Agency Co. Pty. Ltd.	..	..	..	Glenroy
John Burrows Pty. Ltd.	..	..	..	Albury
Creamota Bran	15·4	4·0	9·0	Creamota Ltd., 28 Market-street, Melbourne
†The 1946 Chemical Standard for Bran is	14·0	2·5	10·0	
‡The 1946 Chemical Standard for Pollard is	14·0	3·0	6·25	

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6.25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
Oat Products.	%	%	%	
Parson's No. 1 Oat Branning ..	10·0	6·75	16·0	Parsons Bros. and Co. Pty. Ltd. 554–562 Flinders-lane, Melbourne
Parson's No. 2 Oat Branning ..	7·5	5·75	15·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders, lane, Melbourne
Harper's Star Oat Branning	8·0	6·5	25·5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Ward's Oat Branning	6·0	4·0	25·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Connell's Oat Branning	8·0	5·5	24·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
McKenzie's Oat Branning	7·0	4·0	20·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
A.B.C. Oat Branning	6·0	4·0	25·0	E. T. Moulden and Son Pty. Ltd. 294 Victoria-street, North Melbourne
Creamota Light Brannings	8·5	5·5	25·0	Creamota Ltd., 28 Market-street, Melbourne
Parson's No. 2 Oat Screenings ..	8·5	5·5	13·25	Parsons Bros and Co Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's No. 3 Oat Screenings ..	7·0	5·0	21·25	Parsons Bros and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Connell's Oat Pollard	11·8	9·0	2·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Lyall's Oat Pollard	10·0	7·0	7·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Oat Pollard	10·0	8·0	5·0	J. F. McKenzie and Co. Pty. Ltd. 192 Arden-street, North Melbourne
A.B.C. Oat Pollard	10·0	8·0	5·0	E. T. Moulden and Son Pty. Ltd. 294 Victoria-street, North Melbourne
Rye Product.				
Lyall's Rye Meal	9·0	3·0	4·0	Lyall and Sons Pty. Ltd., 39-51 Leveson-street, North Melbourne
Barley Products.				
Harper's Star Barley Meal	11·5	5·5	15·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Ward's Barley Meal	10·0	4·0	10·0	H. S. K. Ward Pty. Ltd., 24-38 Spencer-street, Melbourne
Lyall's Barley Meal	10·0	2·0	5·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Connell's Barley Meal	10·4	4·5	7·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
A.B.C. Barley Meal	10·0	4·0	10·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Lanray Barley Meal	10·0	3·0	14·0	Lanray Milling Co. Pty. Ltd., 118 Queen-street, Melbourne
Pratt's Ground Barley	7·0	1·0	7·0	David Pratt and Sons, Mair-street, Ballarat
Connell's Barley Branning	10·4	6·0	20·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Harper's Star Barley Branning ..	9·0	4·0	17·5	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's Barley and Oat Pollard ..	11·0	5·5	10·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Lyall's Barley and Oat Meal	10·0	4·0	7·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
McKenzie's Barley Pollard	12·0	3·0	20·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
A.B.C. Barley and Oat Pollard ..	11·0	5·5	10·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Rice Products.				
Harper's Star White Rice Meal ..	10·0	12·5	12·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Harper's Star Brown Rice Meal ..	10·0	17·0	11·9	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's Rice Meal	10·0	19·0	9·5	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-land, Melbourne
Harper's Rice Bran	4·0	7·0	42·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
RICE PRODUCTS.—*continued.*	%	%	%	
McKenzie's Rice Pollard	10·0	15·0	8·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
A.B.C. Rice Bran	5·0	6·0	40·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
A.B.C. Rice Pollard	10·0	15·0	8·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
MAIZE PRODUCTS.				
Polly Gluten Feed	20·0	3·0	9·0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Maize Oil Meal	16·0	12·0	10·0	Maize Products Pty. Ltd., corner Parker and Maribyrnong streets, Footscray
Ward's Maize Meal	7·0	3·0	4·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Lyall's Maize Meal	9·0	3·0	2·0	Lyall and Sons Pty. Ltd., 39 Leveson-street North Melbourne
Clark's Maize Meal	9·0	3·0	3·0	Clark, King and Co. Pty. Ltd., 237 Queen-street, Melbourne
Pratt's Ground Maize	7·0	2·0	3·5	David Pratt and Sons, Mair-street, Ballarat
Parson's Wet Maize Bran	3·0	1·0	2·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
A.B.C. Maize Meal	7·0	3·0	4·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
Moregrain Maize Meal	9·0	3·0	3·0	Norris and Wilkinson, Tinning-street, Brunswick
PEA PRODUCTS.				
Parson's Pea Meal	16·0	1·5	18·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Pea Meal	14·0	1·0	18·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Harper's Split Pea Screenings	15·0	0·75	6·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
Parson's Pea Screenings	16·25	1·0	6·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
McKenzie's Pea Pollard	20·0	1·0	10·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
A.B.C. Pea Meal	20·0	1·0	10·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne
HULLS.				
Parson's Barley Hulls	2·5	0·6	39·75	Parsons Bros and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Connell's Barley Dust	5·0	0·25	18·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Ward's Barley Hulls	2·0	0·8	32·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
McKenzie's Pea Hulls	6·0	0·5	40·0	J. F. McKenzie and Co. Pty. Ltd. 192 Arden-street, North Melbourne
Parson's Pea Hulls	3·5	0·4	46·25	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Pea Hulls	5·0	0·25	40·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Parson's Oat Hulls (A)	1·25	0·4	40·75	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's Oat Hulls (B)	4·25	3·0	30·0	Parsons Bros and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Parson's Oat Hulls (C)	5·0	1·25	34·0	Parsons Bros. and Co. Pty. Ltd., 554–562 Flinders-lane, Melbourne
Ward's Oat Hulls	1·5	0·7	35·0	H. S. K. Ward Pty. Ltd., 24–38 Spencer-street, Melbourne
Connell's Oat Hulls	0·5	0·5	35·0	John Connell and Co. Ltd., 578 Bourke-street, Melbourne
Harper's Oat Hulls	1·0	0·75	40·0	Robert Harper and Co. Ltd., 390 Flinders-lane, Melbourne
McKenzie's Oat Hulls	1·5	1·0	35·0	J. F. McKenzie and Co. Pty. Ltd., 192 Arden-street, North Melbourne
Creamota Oat Hulls	2·0	1·0	32·5	Creamota Ltd., 28 Market-street, Melbourne
A.B.C. Oat Hulls	1·5	0·7	35·0	E. T. Moulden and Son Pty. Ltd., 294 Victoria-street, North Melbourne

LIST OF STOCK FOODS AND STOCK LICKS—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.			Where Obtainable.
	Crude Protein (N × 6·25). Minimum.	Crude Fat. Minimum.	Crude Fibre. Maximum.	
MISCELLANEOUS				
Lucerne Meal	13·0	3·0	25·0	Lyall and Sons Pty. Ltd., 39 Leveson-street, North Melbourne
Lupol	16·0	5·0	30·0	E. C. Robertson Pty. Ltd., 527 Collins-street, Melbourne
Biscuit Sweepings	2·0	2·0	2·0	Swallow and Ariell Ltd., 60 Stokes-street, Port Melbourne
Bakehouse Sweepings	2·0	2·0	2·0	Swallow and Ariell Ltd., 60 Stokes-street, Port Melbourne

VITAMIN OILS.

Distinguishing Brand Name.	Guaranteed Composition. (In International Units per gram.)		Where Obtainable.
	Vitamin A. (Minimum.)	Vitamin D. (Minimum.)	
Sol-Vit-Ax Cod Liver Oil	500	50	G. P. Embleton and Co., 208 Little Lonsdale-street, Melbourne
Unicod Double Fish Oil	1,500	200	Atlantic Union Oil Co. Ltd., 396 Collins-street, Melbourne
Empress Vitaminized Oil	1,000	100	G. P. Embleton and Co., 208 Little Lonsdale-street, Melbourne
Vetemul A Vitaminized Oil	5,000	Nil	Australian Fish Derivatives Pty. Ltd., 6 City-road, South Melbourne
Vetemul A and D3 Vitaminized Oil	5,000	500	Australian Fish Derivatives Pty. Ltd., 6 City-road, South Melbourne
Apsolene Vitaminized Oil	2,500	Nil	Australian Packers Corp. Pty. Ltd., 87 Queen-street, Melbourne
A.A. Emulsion Vitaminized Oil	2,500	Nil	A.A. Emulsion Co., 55 Hobson-road, South Kensington
Sea Pep Vitaminized Oil	1,000	100	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne
Ocean Gold Vitaminized Oil	2,500	Nil	Clark, King, and Co. Pty. Ltd., 237 Queen-street, Melbourne

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron (as Fe_2O_3).	Sulphur.	Iodine.	
STOCK LICKS.	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
Common Salt.								
Hart's Roklik	100·0	..	..	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street South Melbourne
Lepp Salt Lick	100·0	..	..	..	..	..	..	J. S Corden and Co. (Vic.) Pty. Ltd., 44–54 Spencer-street, Melbourne
Ram Salt Lick	100·0	..	..	..	..	..	..	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Ramlic	97·0	..	..	..	..	3·0	..	Cheetham Salt Pty Ltd., 71 Little Malop-street, Geelong
Hart's Iodidised Block Lick	99·0	..	..	..	0·5	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Sulphurised Block Lick	98·0	..	..	..	..	2·0	..	Hart and Co. Pty. Ltd 38 Clarendon-street, South Melbourne
Allkon Iodised Block Lick	99·0	..	..	..	0·5	..	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Allkon Roklik	100·0	..	..	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Allkon Sulphurised Block Lick	98·0	..	..	..	..	2·0	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne

LIST OF STOCK FOODS AND STOCK LICKS—*continued.*

Distinguishing Brand Name.	Guaranteed Composition.							Where Obtainable.
	Salt.	Phosphoric Acid.	Lime.	Magnesia.	Iron (as Fe_2O_3).	Sulphur.	Iodine.	
	% (Max.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	% (Min.)	
Bone Meal, &c.								
Apex Sterilized Bone Meal ..	..	24·0	28·0	..	..	..	..	North Eastern Bone Products, Wangaratta
Cockbill's Bone Meal ..	..	21·76	27·6	..	..	..	..	W. and J. Cockbill, Footscray-road, Footscray
Tricalos Sterilized Bone Flour ..	..	32·5	40·0	..	..	..	..	Glues and By-Products Pty. Ltd., 86 King-street, Melbourne
Cockbill's Bone Grit	..	20·0	25·27	..	..	..	..	W. and J. Cockbill, Footscray-road, Footscray
Pannifex Bone Meal	..	22·0	26·0	..	..	..	..	H. C. Pannifex and Co. Pty. Ltd., 53-57 Munster-terrace, North Melbourne
Imperial Bone Meal	..	27·0	32·0	..	..	..	..	W. Angliss and Co. (Aust.) Pty. Ltd., Lynch-street, Footscray
MIXED STOCK LICKS.								
Non Salt.								
Lictone	..	..	22·0	5·5	14·6	..	..	Permewan, Wright Ltd., 31 King-street, Melbourne
Cobaltised Vic Lic*	..	24·0	29·9	..	5·8	..	Trace	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Vic Lic (D) Sheep Lick ..	..	24·0	29·9	..	2·9	..	Trace	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Vic-Lic G Sheep Lick ..	..	24·0	29·9	..	5·8	..	Trace	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Vita-Lick D	..	23·5	30·0	..	1·3	2·0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vita-Lick G	..	23·5	31·0	..	3·5	4·0	Trace	Goldsbrough, Mort, and Co. Ltd., 526 Bourke-street, Melbourne
Vetsolick	..	11·0	14·0	0·7	1·5	16·6	Trace	A. H. McDonald, & Co. Pty. Ltd., 627 Bridge-road, Richmond
Low Salt.								
Allkon Concentrate	8·0	19·0	30·0	..	1·0	..	Trace	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Vic Lic Concentrated Cattle Lick	5·5	23·0	29·0	..	2·9	..	Trace	Wilcox, Mofflin Ltd., 34 King-street, Melbourne
Immunolic Concentrate ..	8·0	19·0	30·0	..	1·0	..	Trace	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Medium Salt.								
Rudduck's Improved ..	22·2	11·3	20·3	0·6	0·6	2·4	Trace	Rudduck and Co. Pty. Ltd., 556 Lonsdale-street, Melbourne
High Salt.								
Vetamac Medicated	53·0	5·7	7·5	Trace	0·7	4·0	Trace	A. H. McDonald & Co. Pty. Ltd., 627 Bridge-road, Richmond
Syko†	70·0	5·6	4·4	0·6	0·3	10·0	Trace	Sykes (Aust.) Drench Ltd., 4 Union-street, South Melbourne
Immunol Block	91·0	1·9	3·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Allkon Block Lick	91·0	1·9	3·0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Salvitis No. 1	90·0	1·8	2·5	0·2	0·8	0·4	Trace	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Salvitis No. 2	70·0	7·1	8·8	0·2	0·8	4·0	Trace	Cheetham Salt Pty. Ltd., 71 Little Malop-street, Geelong
Lime Licks.								
Allkon Organic Lime Compound	..	..	7·0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne
Hart's Immunol Organic Lime Compound	..	..	7·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Hart's Special Organic Lime Compound	..	..	7·0	..	..	..	..	Hart and Co. Pty. Ltd., 38 Clarendon-street, South Melbourne
Allkon Special Organic Lime Compound	..	..	7·0	..	..	..	..	Allkon Pty. Ltd., 36 Clarendon-street, South Melbourne

* Contains traces of cobalt and copper.

† Contains traces of cobalt, copper, and manganese.

W. R. JEWELL, M.Sc.,
Chemist for Agriculture.

Melbourne, 5th April, 1946.

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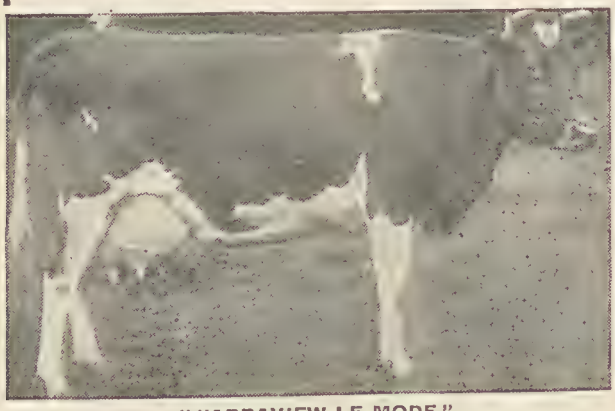

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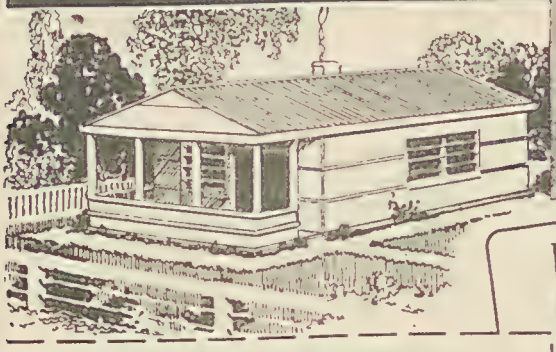

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By GEORGE HYAM, Horticultural Supervisor

DURING the war years thousands of householders grew a substantial proportion of the vegetables consumed in their own homes, while many were able to provide their full requirements. There is little doubt that, without this contribution by home gardeners, the shortage of vegetables for civilian consumption during the war would have been serious indeed. For the purpose of encouraging home gardeners to grow their own vegetables, the Department published a booklet entitled "Wartime Vegetable Growing at Home" as a guide to the novice. The cultural directions in that booklet still apply, but as certain of the limitations then imposed by the absence of many varieties of seeds, shortage of fertilizers, and war conditions generally do not now exist, it is proposed, in this series of articles, to deal more fully with the whole subject of vegetable growing. At present, shortages still restrict the home gardener, but as materials are gradually becoming available, recommendations are based on the assumption that the normal supplies of all garden material will be available shortly.

In the war years the home growing of vegetables was urged on householders as a national duty, and little was said about the other undoubted advantages of growing vegetables in the home garden. Many of those who responded to the wartime appeal however will have found out these advantages for themselves.

It is the custom in Victoria for nearly all homes to be set in a block of land sufficiently large to provide a vegetable patch which, if properly worked, will make a distinct contribution to the household budget and provide the home gardener with an interesting and useful hobby.

Although Victoria has one of the best commercial vegetable supplies in the world there are still many homes on farms and in some country towns in which vegetable consumption is quite inadequate to fulfil all dietary needs. Many farmers visit their market town once every week or so for supplies, but even if that centre is reasonably well supplied, some of the vegetables purchased will inevitably have lost their freshness before they are consumed.

Some Advantages of "Growing Your Own"

Apart from a saving in cost, the advantages of home-grown vegetables may be summarized thus :—

(1) Freshly-gathered vegetables have a higher food value than vegetables which have been stored for some time.

(2) Vegetables used immediately after harvesting are superior in flavour and texture. This applies even more so to raw salad plants.

(3) Vegetables harvested at the proper stage, i.e. just before or immediately at maturity are superior in every way to prematurely or late harvested vegetables.

(4) The home vegetable garden can provide several desirable but uncommon vegetables that are rarely found in the shops.

(5) The raising of vegetables is an interesting, profitable hobby, and the experience gained in soil management when growing them can be usefully applied to ornamental gardening. All gardening work is a splendid relaxation for workers in other occupations.

Once the vegetable beds have been properly laid out and prepared, the work involved is neither monotonous nor laborious. The main point for success is to be familiar with the main cultural requirements of the difficult vegetables; the finer points will reveal themselves by experience.

General Cultivation Hints and Lay-out of the Garden

For the home garden, one has no choice of soils, but has to use the type the house happens to be built on. This is not so disadvantageous as it might seem, for with the intense culture required for vegetables, all soils have to be built-up to some degree. The site chosen should be open and not shaded, but it should be sheltered from winds. For choice, the rows should run north and south so that the sun gets on both sides of the plants. Beds are convenient and easily worked when made in 4 or 5 ft. widths with narrow paths between them so that cultivation can be done without trampling the soil.

Vegetables require a good depth of soil and this is provided by trenching and when the top soil is shallow, by building up the beds so as to provide 12 inches of good soil. The size of the vegetable plot must depend on the area available. The standard English war-time allotment was 90 by 30 ft. which was said to produce all the vegetables required by a family of five. As Victorians are able to average two crops a year an area of about 50 by 30 ft. is about the equivalent to the English allotment from a production point of view. A great deal can be grown on much smaller plots, right down to a few yards devoted to say, salad vegetables. Where only small areas are available, these should be used for growing vegetables which give the highest return per square yard, or to those vegetables which quickly deteriorate after picking. These factors will be tabulated later.

The area and amount of vegetables grown should also be planned according to the amount of time available for their cultivation. Small areas well cultivated, are much better than large plots not tended as well as they should be.

Soil Preparation

Although it is possible to grow a few crops of vegetables on the average soil without much preparation other than simple digging and some manuring, it pays to spend some extra time and labour in bringing new beds into a state of cultivation which will have a lasting effect. Any ground to be brought into vegetable production in the home garden should be trenched to a depth of 18 inches at least. Vegetables are much deeper rooting than is usually realized and loosening the subsoil by trenching will allow them to root deeply, and the occasional working of manure into the lower layers will gradually deepen the topsoil. The method of simple trenching is shown in the accompanying illustration. The effect of this preliminary trenching will last for several years, depending on the texture of the soil. All vegetables need good drainage. The water-table—that is, the height at which free water may exist in the soil, should never be less than 2 ft. from the surface say, 24 hours or so after heavy rain. If this occurs, underground drains should be put in, at or below that level.

Simple Trenching.

1.—First Trench 2 ft. wide (Top layer removed to fill in last trench). 2.—Breaking up second spit with fork. 3.—Marking out second trench 2 ft. wide. 4.—Transferring top soil from second to first trench.

[After R.H.S. (Eng.) The "Vegetable Garden".

1.—Apply fertilizer in a band before seeds are planted. Stretch a line where row is to be sown. With a corner of the hoe make a furrow 3 inches deep, 2 inches to one side of and parallel to line. (*a*) Place fertilizer in furrow. (*b*) Draw soil over fertilizer and level the surface. (*c*) Make a shallow drill to receive seed underneath the line. 2.—Side-dressings for growing crops are applied in furrow 3 inches deep and 3 or 4 inches on each side of row. 3.—For widely spaced plants such as tomatoes or cabbages, fertilizers are applied in a band 6 inches long for each plant, 3 inches deep, 3 or 4 inches from the plant base. 4.—When making liquid manure, measure the quantities—don't guess.

After Hawaii Agr. Exp. Stn. Bull. No. 91.

No digging should be done when the ground is sodden, whether for trenching or the simple digging which is done between each crop. When digging, it is important that each spit of soil should be completely reversed; the surface soil being turned to the bottom and vice versa. To do this, the spade should always be inserted vertically and not at an angle, and the spit deposited with a quick turn of the wrist. In trenching, the subsoil is broken up but not brought to the surface. All beds should be dug over as soon as a crop is finished. Then apply agricultural lime at the rate of ½ lb. to the square yard every year when the beds are dug over in autumn and winter.

Until the beds are planted again, the surface should be left as rough as possible to allow frosts and air to act upon as large a surface as possible. Before re-planting or sowing at any season, the soil should be allowed to settle through rain or in dry weather, by heavy watering. Then just before sowing or planting, the surface should be worked down to a fine tilth while it is moist.

Building Up The Soil

Successful vegetable growing is mostly due to a fertile soil built up by correct manuring, and the application of sufficient soil moisture for the needs of the crops, if the rainfall is insufficient. No vegetable will do well if there is a deficiency of either. The organic or humus content of the soil should be high, and while fertilizers have their place, they should not be used exclusively for vegetable production without some organic matter being added annually. It is possible to grow vegetables by using only organic manure if sufficient quantities are available, as they contain proportions of the essential nitrogen, phosphate, potash, and the less important inorganic plant foods, as well as the organic matter which forms humus. But in many places, the quantity of manure required for exclusively organic manuring is not always available, and deficiencies in this regard have to be made up by using artificial fertilizers. The gardener should, however, use all the organic manure he can possibly obtain, and as we shall see later, even in suburban gardens, a good deal can be saved from waste material

from garden and house. Country residents are more fortunate as animal manures are more readily available. Fowls are another source. The minimum annual addition of organic manure required to keep up the fertility of a vegetable plot may be roughly stated as the equivalent to a 4-inch layer of stable manure or 1 or 2 inches of compost per annum over the whole area. This is best applied before planting leaf crops but it can be dug in before any vegetable crop—other than root crops if it is well rotted down. It can be used before planting tomatoes, potatoes, onions or vine vegetables.

Such applications are known as base dressings, as they are applied before planting. The best fertilizer to use if it is necessary to add to them at that time, is blood and bone. Superphosphate and the mixed artificial fertilizers can be applied as a base, but they are more effective when placed in bands about 2 inches away from the seed row and 3 inches below the surface. Side dressings of these and sulphate of ammonia are applied during the growth of the plants. The aim of the gardener should always be to maintain or increase the fertility of his garden by proper manuring from season to season, and to do this, some knowledge of the functions of the different manures is necessary.

Preparing Organic Manures

A good deal of the value of animal manures or vegetable wastes may be lost if they are dug into the soil in a fresh state. When this is done much of their mineral and organic content is only slowly made available and may be of little use to the next crop. These materials should always be rotted or "composted" down first. Animal manure without a mixture of litter, though fairly rich in plant food, is not so valuable for humus as a mixture of dung and vegetable matter, the best proportion being about 1 part of dung to 5 or 6 of straw or vegetable waste. If this is properly composted, in its final stages, the greater proportion is already humus, which is immediately available to the plant. Any organic waste can be composted, and all of it contains mineral plant foods as well as humus material. Any organic matter can be quickly rotted down if the compost heaps are made properly, but if it is merely piled in a heap haphazardly, the decay is slow, and some of the mineral contents will be lost. It is as well to note that the greater part of the mineral foods in animal manure is contained in the urines present in the dung, and these are readily leeched out by exposure to rain. Proper fermentation during decay also releases minerals contained in the solid matter in manure and vegetable waste.

The modern method of composting or rotting organic material is by building it into heaps of sufficient size to promote fermentation by the bacteria which are present but require air to do their work properly. The heaps are constructed in layers 6 or 8 inches deep. Each layer is covered by an inch or so of animal manure; about ½ inch of soil and then a sprinkling of lime, and built up layer by layer, until the heap reaches 4 ft. in height. Heaps generally are built in units of about 4 ft. x 4 ft. x 4 ft., the width and height being maintained, but the length can be extended as the material is added to. The heaps should be built on the surface of the soil, and not packed down, so that air is present for the bacteria to do their work of decay. Vents in the top are made every 2 ft. or so by driving in a stake or crowbar right down to the bottom of the heap and by rotating the

Liming should be a regular practice in autumn or winter.

MAKING A COMPOST HEAP

st layer of coarse material.

Adding finer materi organic manure.

Sprinkling each layer with agricultural lime.
[After R.H.S. (Eng.)The "Vegetable Garden"]

stake or bar so as to make holes about 4 inches in diameter from top to bottom. This is to allow gases to escape, for if these are allowed to accumulate they will stop the process of decay. After two months, the heap is turned by reversing the layers, placing the top at the bottom, and the sides in the centre. This second heap will be broken down sufficiently for use in about another month.

It is best to shelter the heap from rain but it must be watered if it tends to get dry. However, the mass should never be allowed to become sodden. If the heap becomes too wet or too dry fermentation and decay will cease. Properly constructed, compost heaps have no objectionable odour, whatever material is used, and do not breed flies. The manure used between the layers is known as the activator, and if animal manure is not available, vegetable wastes can still be rotted down by using a dressing of about ¼ inch of blood, or blood and bone manure per layer; or an inch layer of urinated earth (soil that has urine poured on to it). A slower, and not quite so good an activator, is a mixture of super. and sulphate of ammonia (2 to 1) at the rate of a handful to each layer. The finished compost is best applied to the soil as soon as it is completed; if it has to be stored, keep it covered.

Any organic waste capable of being rotted down can be used for compost, and every house can supply quantities of material as well as garden waste. All wood ashes should be placed on the compost heap. Compost can be made in bins or boxes for neatness, but these should have ample side ventilation, and earthen floors.

Using Artificial Fertilizers

The greatest danger in the haphazard use of fertilizers is the liability of the three main plant foods in the soil getting out of balance. Excessive use of, say, nitrogen (sulphate of ammonia) may cause deficiencies in phosphates or potash and vice versa. Some crops need more of one kind than another. Leaf crops for instance need much more nitrogen than roots or peas and should be fertilized accordingly. Most soils here are deficient in phosphate, so that super. dressings in some degree will benefit most crops. Generally speaking, when using artificial fertilizers, it is best to apply complete manures which contain three elements in varying proportions, according to crop. These can be obtained ready-mixed in varying proportions. There are ready-mixed balanced manures like "market garden"

and "blood-bone and super." which are the best to use when in doubt as to the proportions to apply for any particular vegetable crop. Rely principally on organics, using artificials more as a stimulant. "Blood and bone," although manufactured, is an organic manure, and can be applied in quantity with safety and for vegetables it is the best to use to make up any shortage of animal manure or compost, when manuring before planting.

Artificial fertilizers should never come in direct contact with freshly-sown seed or the roots of newly planted seedlings.

Liquid Manures

Applications of liquid manure made from organic material and applied in a weak solution every ten days or so in the warmer weather will benefit any vegetable crop. It is easily made by suspending a sugar bag full of animal manure in a tub or drum of water, and allowing this to soak for 48 hours before using. The first solution should be broken down by adding an equal quantity of water, and then the drum can be filled up again with water and the second solution applied neat. Urine at the rate of 1 pint to the gallon of water is also a good liquid manure. Sulphate of ammonia can be applied at the rate of 1 oz. per gallon but this should be used mainly on leaf crops. Root crops do not need liquid manure. Liquid manure should only be applied when the soil is moist after watering or rain, and for very young plants, the solution should be weaker than for plants nearing maturity.

What To Grow

What to grow in his vegetable patch is always a difficult question for the novice gardener. A selection of varieties has to be made according to the requirements of the household and the area available. Tables will be provided in the concluding instalment of this series to show an estimate of the amount required for an average family of four or five as a guide, though tastes will obviously differ. If the area is very small, preference should be given to those crops which show the highest yield per square yard, or for those which benefit most from being used as fresh as possible and these will also be tabulated. Crops like potatoes which are still palatable after long storage, and crops like cabbage, which occupy a lot of room, are not suitable for small areas. In such cases, preference should first of all be given to salad crops, and high yielders like climbing beans and tomatoes. Every house should have its kitchen herb bed which takes up a minimum of room. On small plots, the planting

Watering the compost heap to ensure moist conditions.

heap ready for vents be made and the final layer applied.

The finished product fertility from waste!

The Seed Bed.—Sow in drills; don't broadcast. Thin out to 2 inches apart. Right.—For transplanting, lift seedlings with a fork, don't pull them out.

of peas is only justified in autumn and early spring as they will then be finished in time to make room for summer vegetables. What to grow is a problem that each must work out for himself, with the aid of the tables to be printed in the concluding instalment of this series.

There are many failures in vegetable growing due to planting various varieties and kinds out of season, and readers are advised to study the planting tables closely, and not be guided by the mere fact that certain plants and seeds are displayed for sale in the shops at certain seasons.

Raise Your Own Plants

It is always more satisfactory to raise from seed those vegetables that are to be transplanted as seedlings. The gardener can then be sure of the variety and can lift them just before planting at the proper stage for planting and they will then become established much better. There will always be some plants on hand to replace misses, and it is also far cheaper to grow seedlings than to buy them. All you need is to construct a small seedling bed in a sheltered corner. Sow the seeds in drills 4 inches apart and thin the seedlings to 3 inches apart when they are in the two-leaved stage. A small glass frame constructed from an old window sash is handy to raise early summer vegetable seedlings such as tomatoes and the vine vegetables.

Soil for seedling beds should not be enriched. Use ordinary soil; or if the soil is heavy, introduce some sandy loam. Dust the bed with a little super. before sowing; after sowing, mulch with about ½ inch of compost or rotted manure. Keep the bed well weeded and watered. A seed bed about 6 ft. by 3 ft. will be ample for the average garden. Seedlings must be thinned out to enable them to develop a good root system. Seed boxes are satisfactory for small lots but this should be filled with at least 4 inches of soil, and the seedlings must be thinned out as in seed bed.

Seed Treatment

Many of the diseases that affect vegetables are borne on the seed, so that it is now the practice by most commercial growers to treat the seed against this possibility. For seeds other than peas, beans, cabbage, cauliflower, and celery a fungicidal seed dust such as Cuprox or Agrosan is used. About a teaspoonful is placed in a glass jar with the seed and shaken so that it coats the seed, the surplus being removed by sieving through fly wire. Peas and beans are dusted in the same way with Tetroc. Cabbage, cauliflower and celery seed is treated by immersion in hot water, a method described in a later instalment of this article. The treatments mentioned are best applied just before sowing.

Sowing Seeds Direct in the Beds

The home gardener usually sows far too thickly, and often too deeply. Planting details, to be found in the planting table, should be adhered to. Where small seeds are sown, rows are best covered with fine soil, sand, or a mulch of compost. A strip of hessian laid along the rows until the seed germinates is also effective. In

(*Continued on page 387*)

SEASONAL DISEASES OF SHEEP

Pregnancy Toxæmia and Hypocalcæmia

By A. R. GRAYSON, B.V.Sc., *Senior Veterinary Officer*

TWO non-contagious diseases of sheep, which have a definite seasonal incidence—occurring during the lambing season—are Pregnancy Toxæmia and Hypocalcæmia. Apart from seasonal incidence these two disease conditions have other points of similarity but Pregnancy Toxæmia affects ewes in the later stages of pregnancy, while Hypocalcæmia more commonly occurs in ewes with lambs at foot. This condition, however, can affect pregnant ewes and, at times, dry sheep including wethers.

Pregnancy Toxæmia occurs more frequently in a dry autumn, while Hypocalcæmia is more prevalent when there is a luxuriant growth of succulent feed. Both conditions may be classed as nutritional in nature and the incidence of both can be considerably reduced by the correct feeding and management of the ewe during pregnancy. The aim in feeding during this period should be to maintain a plane of nutrition which *gradually* rises so as to ensure an adequate food supply for the needs of the ewe and the rapidly developing lamb. As cellulose or fibre is essential for correct bowel functioning in sheep it is necessary to provide a supplementary ration of dry feed particularly when the sheep are on soft lush pastures.

PREGNANCY TOXÆMIA

Pregnancy Toxæmia is one of the most common causes of mortality in pregnant ewes. It is known also as "twin-lamb" disease because affected ewes are frequently found to be carrying twin lambs. This, however, is not always the case, as ewes carrying only a single lamb may be affected.

The disease may occur at any period within about a month prior to lambing. In the early stages, affected ewes appear

rather mopey, and walk with a rather stiff high-stepping gait. They stand by themselves, develop a stupid aimless appearance, become apparently blind, and walk into obstacles. They grind their teeth, and often show a thick yellowish discharge from the nostrils. After two or three days, they go down, become paralyzed, sink into a semi-coma and death occurs in from two to five or six days.

On post-mortem examination the ewe is found to be carrying one or more well developed lambs. The most noticeable abnormality is the condition of the liver, which is greyish-yellow or putty-coloured, and very crumbly. The abdominal fat is plentiful, and shows white, flaky patches scattered through it. The heart muscle is flabby. The paunch is practically empty, and rather flaccid. There is less body fat than would be expected considering the amount of fat in the belly cavity.

Treatment of the disease is not very successful. Drenching twice daily with a cupful of molasses, diluted with an equal quantity of water, may effect a cure in early cases. This treatment, however, to be at all effective, must be given while there is still a desire for food and the ewe can move about and graze. Ewes under treatment should be kept on succulent feed. If the ewe lambs, the symptoms disappear and recovery takes place.

Importance of Nutrition in Control

As indicated earlier this disease is nutritional in character. It occurs when there is a falling off in the nutritional value of the feed during pregnancy, particularly advanced pregnancy. It is most common during a dry autumn, when the feed available at the time the ewe is heavy in lamb is less nutritious than during early pregnancy. Following a normally good season, there is good feed at the end of the year, when the ewes are joined with the rams. Even though the feed may be dry, it is of high nutritive value, and the ewes are in good condition.

If there are satisfactory early rains, there is a plentiful growth of green feed before the nutritive value of the dry feed has deteriorated greatly, so that the ewes have sufficient nutritious feed to carry them through to lambing time.

If, however, good rains do not come until late in the season, the dry feed deteriorates throughout the autumn, and even though there is a quantity of dry grass or stubble, and "dry" sheep or wethers may do well on it, there is not sufficient food value in it for ewes heavy in lamb. Under these circumstances the ewe is forced to make use of food reserves which have been stored in the body fat. The liver is the organ by means of which reserves of fat are converted into the simpler substances, in which forms alone they can be made use of to support life. The liver also is the main storehouse of glycogen which, under these circumstances, is withdrawn to maintain the blood sugar-level—fat taking its place. In the pregnant ewe the whole complicated process of internal metabolism is aggravated by the heavy requirements of the rapidly developing fœtus during the last month of pregnancy, resulting in inefficient functioning of the liver, the formation of injurious or toxic substances and the consequent setting up of a condition of toxæmia or poisoning.

The disease can be prevented, however, by good management. Anything in the nature of a check in the nutritional value of the food during pregnancy should be avoided.

When ewes are on dry feed this should be supplemented by hand feeding, which should be commenced as soon as the food begins to deteriorate, instead of waiting till some of the flock are affected. Oats, good oaten chaff, good quality grass hay, or lucerne hay are all suitable supplementary fodders.

Where self-feeders or troughs are used, these should be sufficient in number, as when there is little other feed available, the stronger sheep are inclined to crowd out the weaker ones, which do not get sufficient feed. It is better to draft off the weaker sheep into a separate paddock. Also, with self-feeders the sheep are inclined to congregate around these all day, and do not get sufficient exercise. It is a good plan to have feeders at the opposite end of the paddock to the dam or water supply, so that the sheep obtain exercise by travelling to and fro. If procurable, molasses added to the diet would be of great value in assisting to prevent the disease. If diluted with water, it can be given on chaff or hay,

or put out in tubs or kerosene tins. It is not a good practice to give molasses by mixing it with salt, for to obtain sufficient molasses, the sheep must take too much salt.

Pregnancy Toxæmia also occurs in ewes on soft green feed where they obtain insufficient exercise. In a season in which there is a prolific growth of soft green feed in the autumn, the ewes become over-fat during pregnancy, and as they become heavy in lamb, do not take sufficient exercise. Although the feed is present in quantity, it does not constitute a balanced ration, and the same symptoms develop as when the ewes are on poor dry feed. To prevent the disease under these circumstances, oaten chaff, meadow hay, or lucerne hay should be given as a supplement to the green feed.

Molasses is also useful as an aid to prevention. The ewes should be made to exercise by droving them every day, commencing at least six weeks before lambing starts. This daily exercise is not only directly beneficial to the sheep but also will help to disclose the presence of any early cases which will be evidenced by an unsteadiness of gait, &c. These cases may thus be picked out for immediate treatment by drenching with molasses.

Compulsory exercise should not be carried to the extent of interfering with nourishment as that will bring on the condition it is desired to prevent.

It should also be noted that ewes which have been on good green feed till near lambing are likely to become affected if suddenly moved on to poorer feed.

HYPOCALCÆMIA

Hypocalcæmia occurs most commonly in in-lamb ewes or ewes with lambs at foot but it also can affect virgin ewes, young sheep and wethers. The name "milk fever" which is sometimes given the condition is therefore not correct.

The onset of the disease is sudden and usually associated with some special factor such as putting sheep on to rank, green feed, especially green crop, droving or trucking long distances, or yarding for a long period without food. Usually numbers of sheep are affected at the one time.

Symptoms

In early stages, affected animals are often seen to be rather staggery in their walk and weak in the hind quarters. They stand about and appear restless and nervous, and have a watery discharge from the nostrils and mouth. The pupil of the eye is widely dilated and the breathing is rapid and panting in nature. They soon go down, often with the back legs extended behind them, and sink into a coma. Frequently, especially after travelling or yarding, they are first discovered down in a state of collapse.

Post-mortem Lesions

On post-mortem, the most noticeable variation from the normal is found in the liver. This organ is very congested, of a blotchy red colour and very friable and crumbly. The lungs also are congested but the heart muscle is not flabby as in pregnancy toxæmia. The rumen or paunch and usually the reticulum are found to be filled to capacity with unmasticated sour-smelling ingesta, but the omasum or bible is generally contracted into a firm lump about one half the normal size. These post-mortem lesions, however, are not in themselves sufficient to establish a definite diagnosis. For this purpose a bio-chemical analysis of the blood is necessary.

Where hypocalcæmia is suspected, one sick sheep should be killed, and a small bottle of blood collected at the moment of slaughter and forwarded to the Director, Veterinary Research Institute, Parkville—(Spencer-street Railway Station). Blood collected after death is of no value. Biochemical analysis of the blood in cases of hypocalcæmia will show a marked reduction —to one half or even one quarter—of the normal calcium content.

Treatment

Treatment of pregnant ewes is not very successful as a rule, but with other sheep, better results are achieved.

Ewes with lambs at foot often respond to inflation of the udder with air without further treatment. A useful makeshift for inflating the udder is the metal nipple of a bicycle tube attached to a bicycle pump; or a hypodermic needle with the point filed off may be attached to a rubber tubing on a pump. Any apparatus must be sterlized before inserting into the teat.

If the ewe does not get up soon after inflation of the udder, molasses should be administered two or three times daily, one cupful of molasses mixed with an equal quantity of water being given for each dose. Molasses gives better results than refined treacle.

The same treatment should be tried for ewes in lamb. Obviously, the earlier treatment is commenced, the more hope there is of recovery.

Injections of calcium boro-gluconate do not give satisfactory results in pregnant ewes, but in other sheep such as lactating ewes, dry ewes, and wethers, the results are good. In cases where the sickness is brought on by trucking or droving, recovery after injection is rapid. Calcium boro-gluconate is a white powder usually dispensed in 2½ oz. packets, and is obtainable from chemists. One packet is sufficient for five sheep. The powder is dissolved in boiled water and injected under the skin. A packet of calcium boro-gluconate should be kept on hand so that it can be tried for treatment immediately sheep become affected. It is used for the treatment of milk-fever in cows also.

Cases of hypocalcæmia and pregnancy toxæmia may occur in the flock at the same time. Calcium boro-gluconate injections may be used for differential diagnosis. The cases of hypocalcæmia will show a ready response to the injection, whilst no result will be obtained in the pregnancy toxaemia cases.

Prevention

It is possible to prevent hypocalcæmia by careful attention to the diet of sheep. Where there is an abnormally prolific growth of green feed, it is better to graze sheep on portion of the property only, and keep the feed on that part under control, than to allow them to graze rank feed over the whole property. Dry feed such as oaten chaff, or oaten or meadow-hay should be given to balance the ration. Molasses may be added to the diet.

Ewes should be compelled to exercise by droving daily if necessary, so that they do not become too fat and sluggish. Hard droving over long distances, however, should be avoided. Sheep should not be yarded or confined in trucks for long periods without food.

SWINE PLAGUE

Swine plague or contagious swine pneumonia is one of the commonest diseases of young pigs in the world, and is a frequent complication of any mismanagement or condition which may lower the resistance of pigs. It is sometimes referred to as "the pants".

The causative organism is called *Pasteurella Suiseptica* and lives normally in the lungs of healthy pigs. If, however, the animal's resistance is lowered due to such things as cold wet sties, unsuitable food, worm infestation or long journeys in transport to market, the bacteria are able to invade the lungs and cause pneumonia. Once the disease has become established in pigs, it can build up in attacking power and infect other pigs with which it comes in contact.

The disease is commonly noticed in store pigs a week after purchase, the animals being off their food and lying about panting. Deaths may occur but most pigs recover to become poor "doers". If a dead pig be opened, the lungs will appear dark red and solid in parts with some dry pleurisy.

Swine plague is a notifiable disease and should be immediately reported to the local stock inspector. There is no cure and usually slaughter of the particular line of pigs at the nearest abattoir is the quickest way to clear up the infection. Quarantine is always maintained until the outbreak is over, and disinfection of the sties with boiling water and a little caustic soda is necessary.

Pigs well fed and housed and bred on the place rarely contract swine plague.

[D. M. Flynn, B.V.Sc., Veterinary Stock Inspector

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

Sheep auction sales in progress at Newmarket

DROUGHT AND LIVE STOCK

STOCK feed supplies for this season are assured, and ample surplus pasture will be available for making into hay and silage at the end of the spring. Stock-owners will be encouraged to build up their flocks and herds again. At the moment, Victorian pastures are very much under-stocked due to the effects of drought and the war. During the three years since 1943, the last normal year, horses have declined by 60,000 head, dairy cattle by 145,000 head, beef cattle by 50,000 head, sheep by 5,000,000 head, and pigs by 36,000 head. In addition to the loss of all of these animals there has been a tremendous loss of meat, wool and dairy produce.

Slaughterings for meat production were high during the two drought years, as it was better business to sell for slaughter all stock which could not be carried. However, many which were held were so weak that, when the break came late in June, 1945, mortality was heavy. During 1945, deaths among sheep were thrice normal and amongst cattle twice normal, emphasizing the great need for holding greater reserves of feed on farms against future droughts.

The losses in meat production during the year ended June, 1946, resulting from heavy slaughterings during the drought, low calvings and lambings and deaths from starvation were approximately 2,000,000 mutton carcasses, 2,000,000 lamb carcasses, 50,000 bullock carcasses, 20,000 carcasses of young cattle and 50,000 "bobby" calves. In the aggregate these losses represent approximately 100,000 tons of meat.

The wool clip for 1945 was approximately 109,236,140 lb., a drop of 65,000,000 lb. compared with production in 1942.

Dairy produce declined during the drought but the percentage loss of dairy cattle was not as high as for sheep because the food requirements of the cattle could be greatly

reduced by drying the cows off. Even from the reduced number of cows, production of dairy produce is already increasing as a result of the splendid autumn feed. However, it is not as high as it would have been if it had been possible to hold on to all the dairy cattle and keep them in fair to good condition on conserved feed during the drought.

The worst feature of a drought is the loss of young stock. In examining the loss of 5,000,000 sheep, it is found that there are 1,750,000 less lambs, 2,000,000 less breeding ewes, and 1,250,000 less other sheep—wethers, dry ewes and rams. In the loss of 145,000 dairy cattle there are 100,000 calves.

More heifer calves and more ewe lambs are urgently needed to build up the herds and flocks to normal again.

DON'T KNOCK YOUR CALVES ON THE HEAD!

As a result of war, feed shortage and the disastrous 1944–45 drought, dairy cattle numbers declined from 1,445,530 in 1943 to 1,299,769 in 1946, but the worst feature of the decline is that there are 100,000 less yearling calves in Victoria today than there were in 1943. This means that there will be 100,000 fewer heifers than normal entering the milking herds in the spring of 1947 to replace aged, unproductive, diseased and dead cows and to provide stock for increasing herds to previous levels and for Soldier Settlement.

Soldier Settlement Commission to Buy Calves

The Soldier Settlement Commission, after consultation with the Department of Agriculture and the Victorian Dairyfarmers' Association, has agreed to buy a number of well-reared heifers at 5 to 7 months old at a minimum price of £5 per head and rear them to near calving stage for soldier settlers. The Commission will pay a premium for quality and the purchasing officer of the Commission will be accompanied by a member of the Victorian Dairyfarmers' Association when making all purchases.

The rearing of heifer calves is a farmer's job and is best done on individual farms where relatively small numbers (up to 50 or 60) are raised at a time.

The advantages of rearing good calves well cannot be over-emphasized, as probably much of the disease which is occurring amongst our dairy cows is due to the failure to build up their constitutions and disease resistance by rearing them well and feeding them well during periods of scarcity, droughts and severe cold winters. More pasture improvement and fodder conservation are necessary to correct this.

Important Points in Calf Rearing

1. The attendant must have patience, perseverance and a thorough understanding of calves. He is their foster parent who has to teach and train them. A calf learns quickly and if taught good habits and has the confidence of its attendant, it will be no bother and calf-rearing will be a pleasure. If not, the calf becomes stubborn and sickly, the job is only half done, and small cattle of weak constitution are produced.

2. The dam must be kept in good condition before calving so that she can nourish the unborn calf well.

3. The calf should be permitted to receive its first feed direct from its mother. This first feed is essential to set the digestive system of the calf working. Afterwards, the calf will usually sleep for twelve hours and wake up with an appetite, ready to suck the fingers and learn to drink.

4. Warm, dry calf pens are essential. Special attention should be given during the first few days until the calf is used to its new environment. Prior to birth the calf is carried by its dam in an environment where the temperature is controlled at 100° F. Average temperatures are 50° F. when the calves are born and until they are used to such temperatures they need warm cosy sheds and beds of clean, dry, loose straw to snuggle into. Later, dry sheds open to the north will suffice.

5. The bucket feed needs to be carefully prepared and fed at blood-heat—100° F. Most feeding troubles are caused by the feed being too cold or too rich. Feed which is too cold, will chill the stomach and feed soon gets cold this weather. It must be heated up. Feed which is too rich cannot be digested. It putrefies in the stomach and upsets the calf. It must be diluted, but in diluting feed, take care to see that too much water is not added. With average Jersey milk, one quart of water can be added to each gallon of morning milk and 2 quarts to each gallon of evening milk. If hot or

boiling water is added, the temperature can be controlled at the same time. No water should be added to average Friesian milk or average morning milk from Ayrshires, Shorthorns or Red Polls.

An average calf requires 6 lb. of milk containing 3·5 per cent. butter-fat at each feed, morning and evening.

New milk may be substituted with skim milk and gruels after the calf is two or three weeks old. Where no skim milk is available, it always pays to feed a little new milk with a gruel.

6. The calf starts to nibble at one week old, after which time it should be run on a good pasture paddock with an open shed in it. Hay or good quality chaff should be offered to the calf as well.

7. Water should always be available in the calf paddock.

OATS FOR PIG FOOD

When barley, wheat or pollard are available in ample quantity, little consideration is given to oats as pig food, but under present circumstances, when all the cereals usually fed to pigs are in very short supply and oats are fairly plentiful, it is worth considering the extent to which oats may be used in economic pig production.

The State Supervisor of the Victorian Section of the Australian Barley Board told a meeting of pig raisers in Melbourne recently that the Barley Board could supply feed oats for pigs, poultry and dairy cattle in 10-ton truck lots at 3s. 3d. per bushel delivered to buyers' railway stations in Victoria.

One ton of oats has not the same pork producing value as one ton of wheat or barley, and if oats form the major part of the pigs' diet, the pigs grow slowly, but when one bag of oats is mixed with two bags of wheat and that mixture is fed in combination with separated milk or meat-meal and minerals, and some green food, good results are obtained.

When fed to pigs in the proportion of one bag of oats to two bags of wheat, oats at 3s. 3d. per bushel is approximately equivalent in pork producing value to wheat at 5s. 6d. per bushel.

Oats should be crushed or ground when fed to pigs.

(L. A. Downey, H.D.A.—Pig Expert.)

CASTRATION OF PIGS

The common abscess formation which frequently occurs following the castration of pigs may be avoided by proper cleanliness during the operation. The first step is to select a clean sty or other suitable clean area which can be sprayed with a disinfectant such as phenyle or carbolic solution. The blade to be used should be sterilized by immersion in boiling water for a few minutes and the scrotum cleansed and disinfected.

A common mistake is to make a small incision on the assumption that it will heal more rapidly. The ideal incisions are ones sufficiently large and low to ensure adequate drainage and avoid the retention of small pockets of clotted blood. It is not necessary to further disinfect the wounds after the cords have been scraped or ligatured and the testes removed. If, however, a disinfectant is applied it should not be irritating like kerosene or sheep dip. Non-irritant disinfectants should be used.

If pigs are castrated at 3 to 6 weeks of age, there is no undue haemorrhage and the pigs have time to recover from the operation before being weaned. One advantage of preparing a clean place for the operation is that when the pigs are released there is less risk of gross contamination of the wounds.

(G. Nicol, B.V.Sc.—Veterinary Officer.)

THE FEEDING OF TABLE POULTRY

There is a keen demand for well-finished birds with an abundance of breast meat and fine bone. The production of birds of this class requires considerable experience. With most heavy birds the feeding of highly fattening foods for a limited time improves the colour of the flesh, especially if the foods are white.

In the early stages, the rearing and feeding of the chickens may be the same as that usually adopted with those intended for egg production, except that a little higher proportion of dried butter-milk or meat-meal could, with advantage, be included in the ration, in order to make their growth as rapid as possible.

Finally, at a suitable age, it is usual to give the birds a short period of intensive fattening. For this purpose they should be confined to small pens or fattening coops

for about two weeks, and trough-fed twice daily on wet mash only (no grit is required). Where specialized poultry production is profitable, the following rations mixed with water to the consistency of thick porridge are advocated :—

	lb.	lb.	lb.
Dried milk (skim milk or butter-milk)	5	..	..
Meat-meal	5	10	10
Ground wheat or barley ..	30	25	70
Ground maize	30	25	..
Ground oats (good quality only)	30	40	20
	100	100	100

Liquid milk may be used in place of the dried product or meat-meal. Approximately 1 lb. of dried milk or meat-meal is equivalent to 1 gallon of separated milk (10 lb.).

The fattening coops can be built 7 ft. 6 in. long, 20 inches broad, and 20 inches high, and may be divided into three compartments, each of which will accommodate five or six birds, or fifteen to eighteen birds in all. Light battens may be used 1½ inches apart, except in front, where they should be 2½ inches apart, so that the birds can easily put out their heads for feeding from the trough, which is placed just outside. The bottom bars on which the birds stand can be made with specially cut wood, 1 inch wide at the top, 1 inch in depth, narrowing to half an inch below, so that the droppings will fall through without catching on the sides, as would happen if the bars were perfectly square. Alternatively, a wire-netting floor can be put in. The coops should be placed in a sheltered position, so as to keep the birds warm. Quietness and freedom from excitement are essential for rapid fattening.

(H. F. Clinton—Poultry Expert.)

BEE-KEEPING NOTES

Advantage should be taken of bright warm days to open the hives and note the condition of bees and fittings. Damp combs showing signs of mildew should be removed and replaced with clean combs composed of worker cells. With the exception of hives selected for rearing drones to mate to young queens, the area of drone comb should be reduced to an absolute minimum. Brood rearing will now be responsible for a much greater demand on stores in the hives and where little or no nectar is available for the field bees, feeding with sugar syrup may be necessary.

Chip all grass from the vicinity of the hive entrance to allow the bees an unobstructed landing. Remove all unnecessary supers and, with weather-proof lids, make the brood chamber as snug as possible.

(J. W. Thomlinson—Apiary Inspector.)

* * * *

Some Items of Interest to Bee-keepers

The largest apiarist in the United States owns 20,000 colonies which gather honey during 10 months of the year by migrating them from one crop to another between Mexico and Canada.

* * * *

The United States Department of Agriculture has asked apiarists to increase their colonies by 8 per cent. to produce more honey and to replace pollinating insects destroyed by modern insecticides.

* * * *

When air transport of bees is arranged, honey in southern clover fields will be gathered by bees which were gathering honey from, or pollinating sub-tropical plants the previous day.

* * * *

Apiaries should be so situated that the bees have a downhill flight when coming home loaded with honey.

* * * *

Bees will fly ten miles in search of nectar, but their lives will be shortened and the amount of honey gathered reduced if they have to fly more than two miles. Most honey will be gathered when it can be collected within a quarter of a mile of the hive.

* * * *

A strong colony contains 70,000 to 80,000 bees, and as wintering colonies contain as few as 5,000 bees, there is a big strain on the bees when they strengthen the hive in the spring to 80,000 again to gather the required quantities of honey. Plenty of food and good young queens are needed.

(*Continued on page 366.*)

QUALITY CHARACTERISTICS OF THE VICTORIAN WHEAT CROP

Season 1945-46

By

W. R. JEWELL, M.Sc., *Agricultural Research Chemist,*
and E. J. O'BRIEN, A.A.C.I., *Cereal Chemist*

The quality data, forming the basis of this report, have been obtained from the critical examination of 760 samples, each representing one week's delivery of wheat to a particular grain elevator. A detailed report was made for the Grain Elevators Board, and the Board has agreed that some of the information contained therein is of general interest and has approved of its being published.

Past surveys have not covered such a large number of samples and the wheat of a particular elevator has been represented by a single sample. While no detailed comparison is possible between this survey and others of past years, the hitherto unpublished results have been generalized to permit comparison between the average of all the samples examined and the F.A.Q. samples.

Seasonal trends in the past have been evaluated solely by the annual examination of F.A.Q. samples and no information has been available to gauge the range of quality throughout the State.

The object of this report is to indicate the range of quality observed, and generally to show the effect of locality upon wheat quality.

Review of 1945-46 Season

FOLLOWING on the disastrous drought of 1945, seasonal conditions were erratic and are reflected in both yield and quality. Scattered heavy rains in February were confined mainly to the Wimmera. Generally, the wheat belt was dry with the moisture reserve of the subsoil much depleted. The autumn was very dry and, with the absence of the usual rains in April and May, many Mallee crops were sown dry. However, good rains in June germinated early crops and allowed the seeding of the late crops to be completed. Prospects deteriorated during the spring, which was much drier than usual. When rain did eventually fall late in October, the early crops were too far advanced to recover from the earlier setback. Yields generally were light, but moderate yields were obtained in some favoured localities, particularly in the North-east. The yield of grain for this season is only 29·6 million bushels compared with the average production of 40·4 million bushels for the ten years ending 1939–40.

Rain in January and February found late crops still unharvested and resulted in bleaching. Mature crops which were bleached but otherwise undamaged gave grain of lower bushel weight than that delivered before the rain, but otherwise of equivalent quality. Some crops which were wetted with these rains and again with subsequent heavy rain, yielded damaged wheat with sprouting and, in isolated cases, with slight mould growth. Many of these late deliveries were below millable quality and were not accepted into elevators, but the quantity of wheat involved was relatively small.

TABLE 1.—WHEAT PRODUCTION IN VICTORIA —GRAIN ONLY.

—	Area.	Production.	Yield.
	Acres.	Bushels.	Bus./ac.
1935–36.. ..	2,323,753	37,552,062	16·16
1938–39.. ..	2,748,362	18,104,369	6·59
1940–41.. ..	2,672,728	13,521,422	5·06
1941–42.. ..	2,757,080	46,953,840	17·03
1942–43.. ..	2,145,156	41,803,107	19·49
1943–44.. ..	1,793,428	19,733,322	11·0
1944–45.. ..	2,141,729	3,497,677	1·6
1945–46.. ..	3,251,393	29,633,760	9·11
Average for 10 years ending 1939–40	2,988,795	40,380,602	13·5
Average for 5 years ending 1944–45	2,302,024	25,101,874	10·9

Wheat Varieties in Victoria

Owing to wartime difficulties, the Government Statist did not compile statistics on the area sown to wheat for the seasons 1942–45. However, the information in respect of varieties sown last season 1945–46 is available and Table 2 shows the percentage of the total area planted to the ten leading varieties.

It will be noted that, following the 1945 drought, 18·9 per cent. of the area was sown with "mixed seed" from bulk storage. As this "mixed seed" was largely sown in the Mallee and Northern districts, it probably comprised varieties such as Ranee 4H, Ghurka, Quadrat, Pindar, and Bencubbin. The decline in popularity of Ranee 4H and Ghurka is, therefore, not so marked as the table would indicate. However, the general trend, as indicated in Table 2, shows a

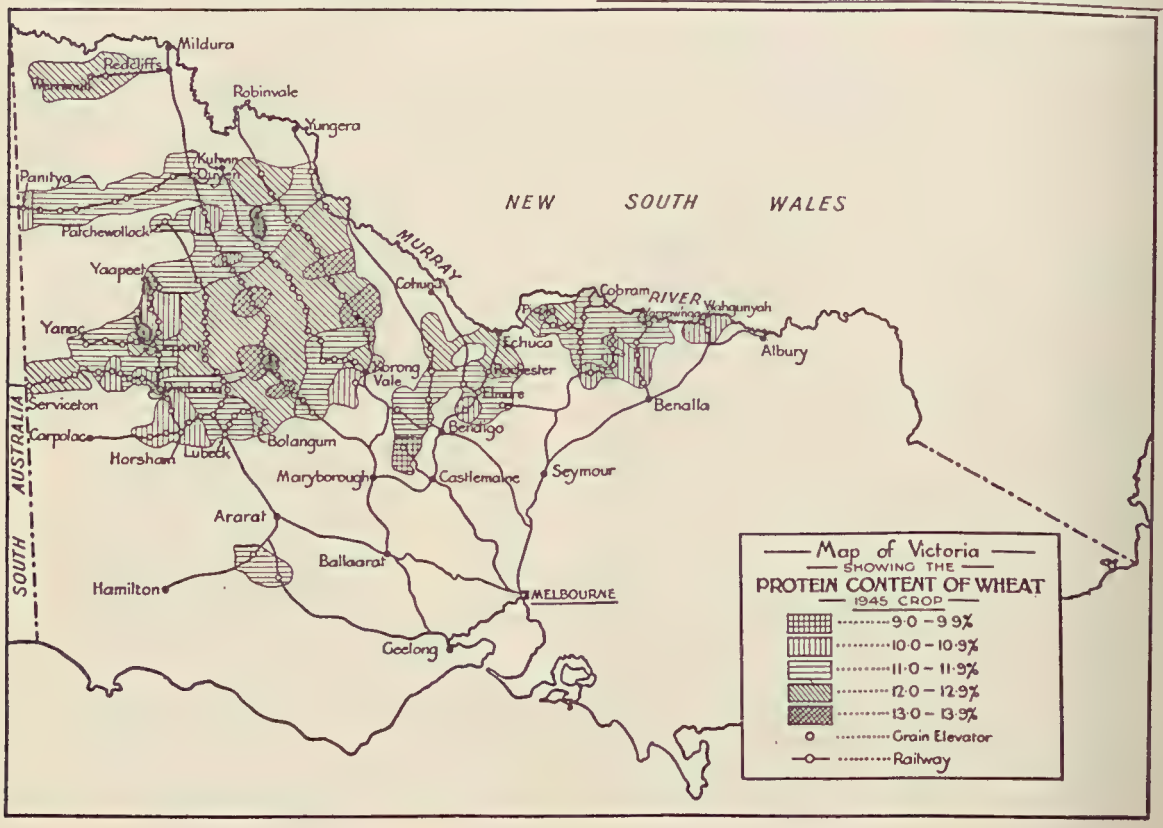
TABLE 2.—WHEAT VARIETIES SOWN IN VICTORIA (PERCENTAGE OF TOTAL WHEAT AREA).

Variety.	1945–46.	1941–42.	1940–41.	1937–38.	1935–36.
Ghurka ..	25·7	52·7	47·6	45·1	34·9
Quadrat ..	19·9	0·3	..	..	..
Pindar ..	7·6	..	..	..	..
Ranee 4H ..	6·9	18·2	20·2	20·7	22·1
Magnet ..	6·4	1·5	..	..	..
Bencubbin ..	6·0	5·1	5·3	2·3	0·3
Regalia ..	4·1	2·5	1·9	..	..
Dundee ..	2·4	6·2	8·6	9·0	0·3
Bobin ..	1·1	1·9	2·1	1·1	0·5
Free Gallipoli	1·0	5·0	5·8	11·6	24·9
Mixed seed..	18·9*	..	..	..	..
All other ..	..	6·6	8·5	10·2	17·0
Total ..	100·0	100·0	100·0	100·0	100·0

* Includes both wheat from silos and stacks used as source of seed owing to 1944 drought, and also other less popular varieties.

TABLE 3.—PERCENTAGE OF FIVE LEADING WHEAT VARIETIES.

—	Mallee.	Wimmera.	Northern.
	%	%	%
Ghurka	21·2	26·9	34·5
Quadrat	9·3	38·9	16·9
Pindar	13·2	2·5	2·4
Ranee 4H ..	9·6	2·3	7·3
Magnet	0·8	13·4	9·0



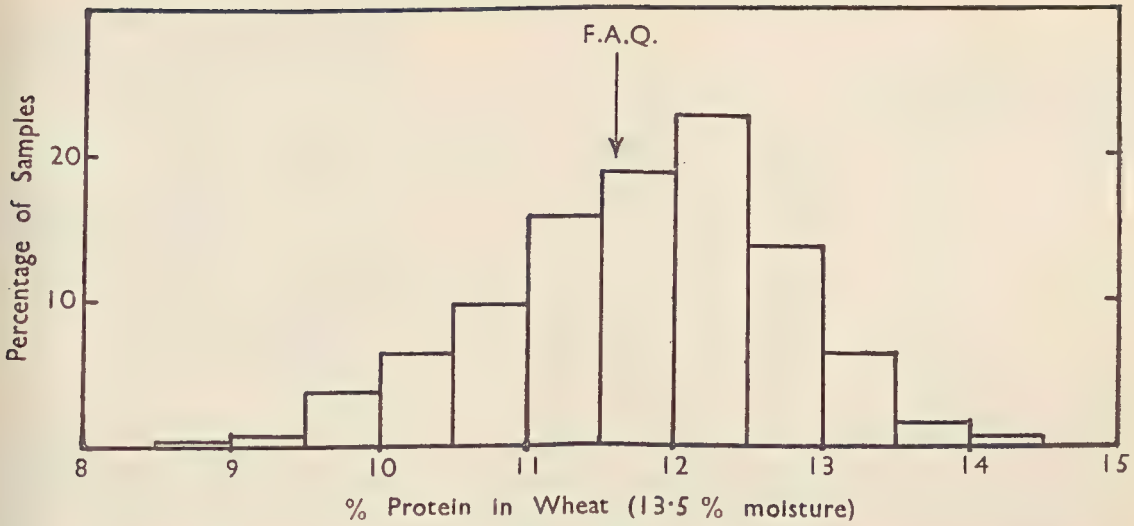


Fig. 1.—Frequency diagram showing percentage of samples falling within each 0.5 per cent. protein range.

decline in the area sown to Ghurka, Ranee 4H, Dundee, Bobin, and Free Gallipoli, and an increase to Quadrat, Pindar, Magnet, Bencubbin, and Regalia.

The estimated percentage of each of the State's five leading varieties sown in the Mallee, Wimmera, and Northern districts for this season is shown in Table 3.

Protein Map

The protein map has been constructed from the results of testing samples collected from individual grain elevators. The areas outlined do not include those normally delivering in bags, and generally coincide with the prescribed areas feeding the elevators.

The map represents a general rather than a detailed picture of the protein content of Victorian wheat.

Protein maps for past years exhibit a general resemblance to this year's map. The highest protein contents are found in the Eastern Mallee, whilst the Wimmera plains are lower than the average. The Northern Mallee and the North-eastern districts are irregular, showing adjacent areas of high and low protein content. However, there is considerable seasonal variation, and while it is possible to note a tendency toward high or low protein content in a particular district, much more information will be required before these trends can be confirmed, or predictions made regarding the relative protein content of any wheat-growing area.

Protein Distribution and Relationship to F.A.Q. Sample

Figure 1 shows the distribution of protein content within the 760 weekly samples examined. It is seen that the F.A.Q. sample is reasonably close to the average of all the samples represented in the frequency diagram. While this would be expected, it must be noted that no indication of the range is possible with a single sample.

Table 4 compares the official F.A.Q. sample with the average of the elevator

TABLE 4.—SEASONAL PROTEIN VARIATION.

Year	1941–42.	1942–43.	1943–44.	1945–46.
Number of elevators sampled	91	117	136	137
*Protein content (average) %	9·8	10·6	10·2	11·7
*Protein content (variation) %	7·9–12·7	8·8–13·7	7·9–12·3	9·9–13·2
*Protein content (range) %	4·8	4·9	4·4	3·3
*Protein content (F.A.Q. sample) %	10·0	10·9	10·1	11·6

* Calculated on 13·5 per cent. moisture basis.

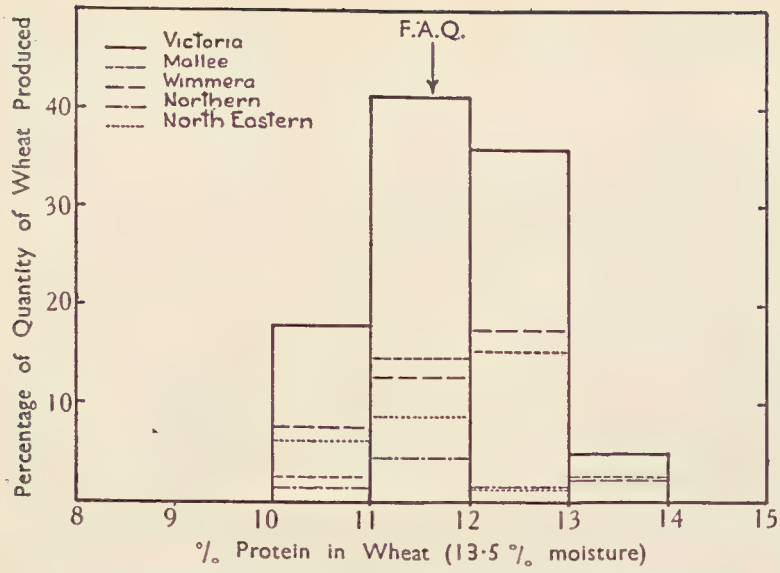


Fig. 2.—Frequency diagram showing percentage of total wheat produced falling within each 1 per cent. protein range.

samples for the years 1942–46 (no results are available for the drought year 1944–45). The agreement is good and indicates that the F.A.Q. sample serves a useful purpose in assessing general seasonal trends in protein. The official F.A.Q. sample is frequently criticized because it fails to indicate the range of quality and Bottomley (1943)* showed its limited value to millers and other purchasers of large amounts of wheat.

This season the range in protein content throughout the State, as indicated by the weekly samples, is 8·5 to 14·5 per cent., and although it is probable that most consignments of grain will fall close to the average, the fact that both high and low values are possible should be realized.

There is a further range within each elevator due to variation in the wheat received. This range has been measured by the difference between the highest and the lowest protein of the individual weekly samples from an elevator. The greatest variation found was 3·2 per cent., while the average for all elevators was 1·2 per cent. A variation of this order is unavoidable and, as thorough mixing within the elevator is impracticable, deliveries would be expected to exhibit some range in protein content, although not necessarily of the same order.

* BOTTOMLEY, R. A. (1943). Variation in the Protein content and Diastatic activity of Victorian Commercial wheat. J. Aust. Inst. Agric. Sc. 9, 20.

Figure 2 is a quantitative representation of the data shown in Figure 1. The total amount of wheat represented by the samples is approximately 17 million bushels, and the quantitative distribution of this amount is shown with comparative diagrams for the four main wheat-growing districts.

Grouping of Elevators according to Protein Content

Tables 5, 6, 7, and 8 list the elevators in the Northern, North-eastern, Wimmera and Mallee districts according to protein content and show the percentage of the total quantity of wheat for the State and for the district each represents.

TABLE 5.—NORTHERN ELEVATORS.

Protein Content.

10·0–10·9%	11·0–11·9%	12·0–12·9%
Wedderburn Goornong	Buckrabanyule Barrakee Boort Tandarra Raywood Hunter Elmore Colbinabbin	Wychitella Mitiamo Rochester
District % 18·0	61·3	20·7
State % 1·4	4·7	1·5

TABLE 6.—NORTH-EASTERN ELEVATORS.

Protein Content.

10·0–10·9%	11·0–11·9%	12·0–12·9%
Pine Lodge Dookie Youanmite Goorambat Devenish St. James Rutherglen	Nathalia Tallygaroopna Wunghnu Numurkah Katunga Cobram Cosgrove Yabba North Katamatite Tungamah Telford Yarrawonga	Picola Waala
District % 37·1	53·5	9·4
State % 6·1	8·9	1·5

TABLE 7.—WIMMERA ELEVATORS.

Protein Content.

10·0–10·9%	11·0–11·9%	12·0–12·9%	13·0–13·9%
Salisbury	Antwerp	Serviceton	Massey
Gerang Gerung	Coromby	Lillimur	Litchfield
Wail	Burrum	Kaniva	Cope Cope
Arkona	Tarranginnie	Miram	
Dooen	Kiata	Detpa	
Ellam	Dimboola	Brim	
Natimuk	Jung	Lah	
Pimpinio	Lubeck	Batchica	
Vectis	Yanac	Warracknabeal	
	Netherby	Sheephills	
	Lorquon	Minyip	
	Jeparit	Banyena	
	Tarranyurk	Marnoo	
	Nullan	Bolangum	
	Jackson	Morton Plains	
	Sutherland	Watchem	
	Glenloth	Donald	
		Swanwater	
		Wycheproof	
District % 18·8	31·6	44·2	5·4
State % 7·6	12·7	17·7	2·2

TABLE 8.—MALLEE ELEVATORS.

Protein Content.

10·0–10·9%	11·0–11·9%	12·0–12·9%	13·0–13·9%
Lascelles	Nyah West	Pira	Barraport
Speed	Piangil	Quambatook	Gredgwin
Tempy	Waitchie	Cannie	Lalbert
Rainbow	Chillingollah	Meatian	Kinnabulla
Albacutya	Boigbeat	Ultima	Curyo
Panitya	Sea Lake	Gowanford	
	Nyarrin	Chinkapook	
	Woomelang	Manangatang	
	Gama	Dumosa	
	Ouyen	Nullawil	
	Hopetoun	Warne	
	Patchewollock	Culgoa	
	Yaapeet	Berriwillock	
	Galah	Birchip	
	Walpeup	Watchupga	
	Underbool	Galaquil	
	Linga	Beulah	
	Tutye	Rosebery	
	Cowangie	Karrawinna	
	Murrayville	Werrimull	
	Carina		
District % 8·0	41·6	42·6	7·8
State % 2·9	14·9	15·3	2·8

TABLE 9.—ANALYTICAL RESULTS.

District	Wimmera.				Mallee.				Northern.			North-eastern.		
Wheat protein (range) per cent.	10·0–10·9.	11·0–11·9.	12·0–12·9.	13·0–13·9.	10·0–10·9.	11·0–11·9.	12·0–12·9.	13·0–13·9.	10·0–10·9.	11·0–11·9.	12·0–12·9.	10·0–10·9.	11·0–11·9.	12·0–12·9.
Flour extraction per cent.	69·2	68·7	69·0	69·0	71·1	71·0	69·0	70·7	70·4	70·0	69·3	72·7	72·7	71·0
Flour protein (N × 5·7) per cent.	8·9	9·7	10·7	11·3	9·1	10·2	10·9	11·2	9·2	10·1	10·8	9·0	10·3	10·9
Wet gluten per cent.	27·0	33·5	39·3	40·5	29·5	29·0	34·0	38·0	28·5	33·0	34·5	29·5	34·0	34·5
Dry gluten per cent.	9·0	10·7	12·5	13·4	9·3	9·4	10·7	12·3	9·0	10·5	11·0	9·5	11·4	11·5
Water absorption (Farinograph per cent.)	56·8	59·4	60·6	62·8	58·4	59·0	60·2	60·9	56·8	56·2	61·0	58·7	58·6	60·8
Valorimeter number (Farinograph)	38	38	40	38	36	40	38	38	40	36	38	40	36	36
Maltose figure (mgrms. maltose per 10 grms.)	85	80	80	76	85	80	85	90	90	90	80	96	85	96
Loaf volume c.cs. (malt + phosphate)	500	530	540	550	530	555	545	540	460	490	555	500	510	500
Loaf score per cent.	66	72	76	78	69	78	78	77	59	69	78	70	70	70

Baking and Analytical Results

Table 9 shows the analytical results obtained from composite samples, each representing a group of elevators of a particular protein range as listed in the previous tables. The water absorption as measured by the Farinograph increases with increasing protein content, but the curve shape is almost identical with that of the 1946 F.A.Q. sample (O'Brien 1946*) over the full protein range. Consequently, the curve for the F.A.Q. sample is reproduced in Figure 3 as being representative of all the samples examined. The diastatic activity is low and district effects are not pronounced. All the figures are lower than the official F.A.Q. sample (Maltose figure 111), and this difference can probably be explained by the fact that the F.A.Q. sample included some grain which was more seriously bleached than the samples in Table 9.

The flour extraction is that obtained on the laboratory roller mill and although lower than that obtained in commercial practice, the resultant flour is equivalent in quality to unbleached, commercially-milled flour, milled from the same wheat.

*O'BRIEN, E. J. (1946). Victorian F.A.Q. Wheat, Analysis of 1946 Sample. J. Dept. Agric. Vict., April, 153

The baking properties of the flours tend generally to improve with increasing protein content, but there would appear to be a district or varietal influence causing discrepancies. However, results over more than one season would be required before any conclusions may be drawn.

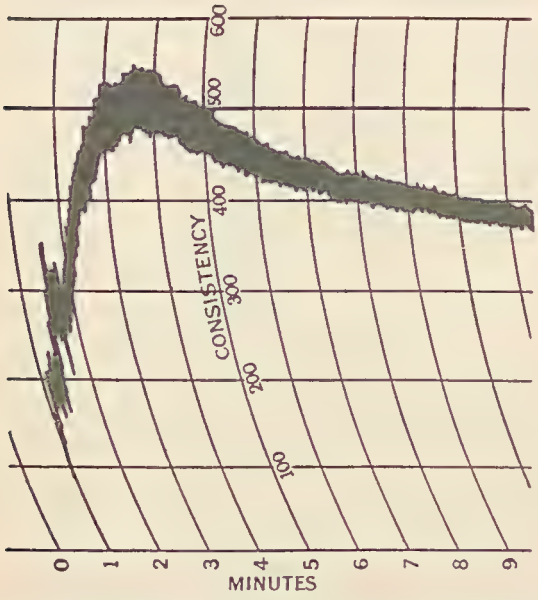


Fig. 3.—Farinogram for 1946 sample of F.A.Q. wheat.

Summary

The protein status and distribution of Victorian wheat for this season based on the results of testing weekly samples of wheat from each grain elevator are given, together with the baking results for composite samples of various protein contents.

Since testing in the past has not been on the same basis, general rather than detailed comparisons with past seasons have been made.

The quality of this season's wheat, as judged by protein content, is higher than usual and is consequently reflected in improved baking quality of the resultant flour.

Acknowledgment

The sampling of wheat received at grain elevators was done by officers of the Grain Elevators Board, and acknowledgment is made of the efficient manner in which the sampling and forwarding of samples was performed

The permission of the Grain Elevators Board to publish the information contained in this report is also acknowledged.

LIVE STOCK NOTES *(continued from page 360).*

The biggest problem beekeepers have to face is the greater use of insecticides, but D.D.T. is believed to be less poisonous than many of the arsenical sprays and dusts previously used.

* * * *

Within six weeks of introducing a new queen to the hive, all of the workers will be her daughters.

* * * *

Many American apiarists do not produce honey. They specialize in package bees which are sold to orchardists, market gardeners and seedsmen for fertilizing the flowers. The bees are purchased just as the flowers are ready for pollinating and use the package as their home. They are destroyed at the first spraying or dusting. One colony of bees per acre is usually adequate to fertilize most crops.

* * * *

Swarming can be controlled and strong colonies built up by using two brood chambers, one on top of the other, in the spring, summer and autumn, and by providing ample supers. The brood nest tends to work upwards, and every ten days or so, the lower brood chambers should be interchanged with the upper ones. Then there will be little or no crowding and the colony will not make any preparation for swarming.

* * * *

In America, at least 50 commercial crops depend upon bees for pollination.

* * * *

As with farm mammals and poultry, shortage of feed is the biggest problem to be overcome with bees. Bees must have food all the year and if they are not storing it in the form of honey, they are eating the stores. A good colony requires at least 60 lb. of honey to see it through the winter.

* * * *

Yes, the bee is an animal just as is a cow or hen. To be more specific, the bee is an insect, the cow a mammal and the hen a bird.

GARDEN PEA SEED

New Approval Scheme in Operation

By F. M. READ, M. Agr. Sc., *Chief Inspector of Horticulture*

Prior to 1939 not more than a few hundred acres of Garden Pea Seed were grown annually in Victoria. During the war, it was necessary to grow up to 7,000 acres, and some very fine seed was produced from crops of high purity and freedom from disease. This was due to the careful rogueing carried out by Victorian growers during the war years, and if the same methods are followed in peacetime there is no doubt that locally produced seed can more than hold its own with the best of imported seed. To enable buyers more readily to distinguish such high quality lines, a Departmental seal and identifying tag will be affixed to sacks containing seed which has been produced under the conditions set out hereunder. Notable improvements to locally manufactured harvesters were made during the war years, and growers of approved seed should be sure that their machines are equipped with the best pea-harvesting attachments. There is ample land in favoured situations in southern Victoria on which high quality pea-seed crops can be economically produced.

APPROVAL OF PEA SEED.

APPROVAL of pea seed will be carried out by the Victorian Department of Agriculture subject to the following conditions :—

1. The Department reserves the right to accept or reject applications for approval. Applications will be accepted only from districts in which the inspection work can be carried out conveniently.

2. A crop shall not be eligible for approval unless it is grown on land which has not grown peas of another variety during the previous two years, or an unapproved crop of the same variety during the previous year.

3. A crop shall not be eligible for approval unless separated from any other pea crop by a distance deemed sufficient by an officer of the Department.

4. A crop shall not be eligible for approval unless grown from mother seed which is known to and has been declared suitable by the Department.

5. Where a crop grown from seed previously approved by the Department exceeds the tolerance for seed-borne infection with respect to any of the diseases covered by the approval scheme, the Department reserves the right to reject for approval all other crops grown from seed from the same source.

6. A crop shall not be eligible for approval unless the grower satisfies the Department that at no time during carting, storing, sowing, harvesting, threshing and cleaning will seed subject to approval be liable to contamination by unapproved seed or by equipment in which unapproved seed has been handled.

7. A crop shall not be eligible for approval unless the grower agrees not to pick any of the crop for the green pea market.

Crop Standards and Inspection.

8. A crop shall not be approved if it contains more than 0·1 per cent. of plants of another variety or contains any trace of Bacterial Blight (*Pseudomonas pisi*) on any part of the plant or lesions of Aschochyta Blight (*Mycosphaerella pinodes, Ascochyta pinodella* or *Ascochyta pisi*) or Septoria Blight (*Septoria pisi*) on the pods during field inspections.

9. The Department may reject for approval at any time a crop in which excessive weed growth prevents or unduly delays the Inspecting Officer making a thorough inspection of the crop.

10. For the purpose of determining whether crops conform to the above standards crop inspections will be made by officers of the Department at such times as are deemed necessary by the Department.

Application of Growers for Approval.

11. A grower desirous of submitting a crop for approval shall, not less than two weeks prior to sowing, make a written application to the Director of Agriculture, in or to the effect of Form A and pay a fee of £1 1s. for each crop. The grower shall not sow the crop until authorized to do so by an officer of the Department, who will inform the grower whether the Department can arrange the necessary inspections.

FORM A.

DEPARTMENT OF AGRICULTURE, VICTORIA.
PEA SEED APPROVAL.

To The Director,
Department of Agriculture,
Melbourne.

I .....

Address .....

.....

.....

desire to submit for inspection, with a view to "Approval" the proposed pea seed crop described hereunder.

Location .....

Acreage .....

Variety .....

Source of Seed .....

A fee of £1 1s. is forwarded herewith and I agree also to pay sealing fee of 2d. (twopence) per bushel or part thereof.

Signature .....

Date .....

Harvesting, Threshing, Cleaning of Seed

12. The grower of a crop subject to approval shall not, except with the sanction of an officer of the Department whose decision will be final in cases of disputes, harvest, thresh or clean the seed or remove any seal affixed by the Department.

The grower shall give, in writing, at least seven clear days' notice of his intention to carry out any of the above operations to an officer of the Department whose name and address will be notified to the grower at the time he is authorized to sow the crop.

13. No seed shall be moved from the property on which it is grown nor in any place where it is subsequently handled except in *new bags* which have been sealed by an officer of the Department and branded with the name and address of the grower and the variety of seed. If subsequent cleaning is necessary it must be carried out in premises approved by an officer of the Department and under his supervision. No seals shall be removed by any person except under Departmental supervision.

Labelling and Sealing Approved Seed.

14. To parcels of seed conforming to the above conditions and of not less than one bushel (60 lb.) net weight (except by special arrangement with the Department) a seal and approval label will be affixed and a copy of the label will be placed in the parcel before sealing.

15. The charge for sealing and labelling will be twopence per bushel or part thereof of cleaned seed when cleaning is completed on the farm; but where seed is sealed on the farm prior to removal to another place for cleaning the charge for farm sealing will be one penny per bushel or part thereof and a further charge of one penny will be made when the seed is finally sealed.

The approval label will be inscribed as under:—

APPROVAL LABEL.
VICTORIAN DEPARTMENT OF AGRICULTURE.
APPROVED PEA SEED.

This seed is the produce of a crop which contained not more than 0·1 per cent. of plants of another variety and in which no evidence of Bacterial Blight (*Pseudomonas pisi*) in the plants nor lesions of Asochyta or Septoria spp. on the pods could be detected during field inspection.

Variety .....

Grower's name .....

Grower's address .....

Signature of Departmental Officer .....

Date .....

On the opposite side of the label the following may be inserted:—

WARNING.

To obtain best results from this seed:—

1. Do not store it in contact with unapproved seed.

2. Do not sow it with a drill which has not been thoroughly cleaned out.

3. Do not sow it close to seed which is below approval standard.

4. Do not sow on land which grew an unapproved crop of peas last season.

Records to be Kept by Grower.

16. The grower of approved seed and any person who purchases such seed for resale shall keep a careful record of all seed sold by him including the name and address of purchaser, variety and quantity of seed purchased and date of despatch of consignment. Such records shall be made available for the information of the Department of Agriculture if required.

DOGS ON THE FARM

By E. BROUGH, B.V.Sc.,
Veterinary Officer

The dog has won for himself a prominent position in Australian rural life, so much so that a farm without its dogs would be difficult to imagine. On the farmsteads you will find dogs in their infinite variety—sheep, cattle, game dogs—all performing their various functions as extenders of their owners' authority. In this role they save the farmer's time, his horseflesh, his legs and quite frequently, his temper. The enthusiasm with which a dog will race through a scrubby paddock, cross a swollen stream, run miles to round up a few head of stock merely at the command of an almost stationary owner, is an object lesson in obedience and energy. Such qualities however do not always bring their proper reward, for quite often valuable farm dogs are not treated as they should be. Feeding, housing, and attention to well-being are too frequently neglected, an expensive omission, for quite apart from its inhumanity, this maltreatment reacts to the disadvantage of the owner. A little consideration in providing warm, clean quarters for the dogs, feeding them on good, wholesome food, and attending to their health, will increase efficiency, improve appearance and give the owner a bunch of robust, well-groomed dogs he will not be ashamed to call his own.

HOUSING

A kennel for each dog is desirable. The kennel should be large enough to allow plenty of room for the dog to stand up and turn round; it should be warm and weather-proof and so constructed that it may be easily cleaned out. Clean bags, which can be hung out in the sun periodically, make a satisfactory bedding, especially in cold weather. The kennels should be placed in a position sheltered from cold winds and rain as well as from the direct heat of the sun, while provision should be made for drainage in wet seasons.

An intelligent, friendly head.

To maintain the dog in good health, exercise is necessary, and may be provided by a daily run, or, if the space is available, by attaching the chain to an overhead wire stretched between two posts. This will give at least some exercise while the dog is on the chain.

To maintain the surroundings in a clean condition, the kennel should be moved from time to time, or if this is impracticable the site should be cleaned up thoroughly at regular intervals. This should include the replacing of the fouled earth with clean soil.

FEEDING

Feeding is most important. If dogs are ill-fed or underfed they will not work as required, nor will the bitches produce good quality litters. There should be no difficulty in providing adequate and suitable food for farm dogs. The greater part of the diet should consist of meat, both muscle meat and livers, hearts, &c. Some vegetables or cereals should also be fed. If the dog will eat raw green vegetables these may be given. Failing this, bread and milk or dog biscuits may be fed. Where plenty of milk is available, the proportion of meat to vegetables in the diet may be reduced.

On properties where killing is done it is frequently the habit to toss the various organs without inspection or cooking to the dogs. This practice is not advisable however, as sheep and cattle act as intermediate hosts for the tapeworm which

Periodical grooming and dusting with an insecticide powder contribute to a dog's comfort and appearance.

causes hydatid disease. To check this disease, which is very serious in man, all offal, especially liver and other visceral organs, should be cooked by boiling for 10 or 15 minutes before feeding to dogs. A clean and adequate supply of fresh water should also be available to the dog at all times. In cool weather, the water supply should be changed daily, and in hot weather several times a day and placed in a shady position.

Periodical grooming and de-fleaing will add to the comfort of the dog and possibly of his owner. A wide-toothed comb and a hair brush provide all the materials necessary for grooming. Bathing is not essential, and might be detrimental to the dog's health. An occasional dusting with a flea powder containing derris or D.D.T. will help to keep the dog clean. To keep down fleas in the kennel or house, D.D.T. powder or spray should be worked into all cracks and crevices.

HEALTH

Hydatid disease, mange, and eczema are three diseases liable to occur, even where there is little outside contact with other dogs. Where there are young dogs and outside contacts, outbreaks of distemper may result in serious illness with a high mortality rate. Rickets should never occur in this country where there is plenty of sunshine, and milk and lime are always available.

Hydatid Disease—gains its name from the cysts it forms in sheep, cattle, pigs and man, in which animals the intermediate stage of the life cycle of the parasite is passed. The mature tapeworm in the dog sheds the segments which pass out in the faeces. Frequently, the dog defaecates on pasture where sheep are grazing. The latter graze on contaminated spots and pick up the eggs released from the tapeworm segments. The embryos develop inside the sheep, gain entry to the blood stream and are carried to the various body organs including the liver and lungs, where they develop into cysts, that is watery filled sacks. These cysts contain the heads or scolices of new tapeworms, and if eaten by a dog, develop into adult tapeworms so completing the life cycle. Hence, if raw meat and offal be fed to a dog, the cysts can develop and form new worms. If a human being should ingest tapeworm eggs, similar cysts are set up and may cause a great deal of damage in the brain and spinal cord, the lungs, and other organs. To guard against infection do not allow children to handle the dogs and adults who must handle dogs for any reason should thoroughly wash the hands afterwards.

Control

To control the disease, the dogs should be treated every two months with arecoline hydrobromide. One ½-grain tablet of this drug should be dissolved in two tablespoonfuls of water, of which solution large dogs should be given 2 to 4 tablespoonfuls and pups and small dogs 1 teaspoonful. Walk the dog about for 5 to 10 minutes and then tie him up on some bare patch of earth or concrete. When the medicine has worked, collect the droppings and burn them. Also collect and burn all droppings about the kennel, &c. As stated earlier, the practice of feeding raw offal to dogs should be discontinued. After the fleeces of sheep have been handled, the hands should be washed thoroughly.

Mange is a skin condition due to a mite which burrows into the skin to lay its eggs. This causes intense irritation and scratching, and is accompanied by an exudate which coagulates and forms crusts on the skin. As a further result of the infection, the skin becomes thickened, wrinkled and bare. The lesions are most commonly found on the less densely hairy parts such as the hocks, elbows, muzzle, and root of the tail. Spread is rather slow, but may, if unchecked, extend to all parts of the body.

Treatment is best applied after isolating the affected animals. Clip the affected areas and treat them with lime-sulphur preparations or sulphur ointments.

Eczema.—There is a certain amount of similarity between eczema and mange. However, eczema is not a contagious disease and therefore isolated cases are more often found than with mange.

Eczema is an inflammation of the skin causing small vesicles or blisters in the early stage, which later develop into pustules with scab or dandruff formation. The degree of irritation present is variable.

The trouble seems to be associated with both internal (e.g. indigestion) and external conditions. The majority of cases however are associated with indigestion, but a few are associated with nervous troubles following distemper. Dirt, closely matted into the skin, irritant soaps, such as soft soaps and medicated soaps, and external parasites play a part.

Eczema may be either dry or moist. In the former case, there is a formation of dandruff or flakes of dead skin, but little pain. In moist eczema, the hair becomes matted together by the exudate and may be underrun by pus. The irritation is intense, causing much rubbing and biting. Dogs are most frequently affected along the back, although other areas are subject to attack.

Treatment is best effected by a complete change of diet. Reduce or eliminate meat in the diet and feed milk, cereals, and vegetables, or if no meat is fed, vice versa. A tablespoonful of liquid paraffin twice a week should also be given. In chronic, long-standing cases, 2 to 8 drops of Fowler's Solution (obtainable at a chemist's shop) may be given once daily in the food. The use of irritant soaps should be discontinued, and, if the animal must be bathed, use plain bar washing soap and rinse thoroughly in warm water. Dry the dog immediately or take him for a run until he dries off.

Where the amount of exudate is small, dust the area with a powder of equal parts of zinc oxide or carbonate, boric acid and kaolin. If the surface is moist, do not use a dusting powder as this tends to form a crust. Clean the area thoroughly with weak dettol or a similar disinfectant (1 dessertspoonful in a pint of water) and then paint with white lotion or apply a zinc or sulphur ointment.

A certain amount of freedom is allowed this dog by attaching his chain to a length of piping. The well-constructed, movable kennel on the right provides its canine tenant with a cosy, clean shelter.

Distemper is an acute, highly infectious and sometimes fatal disease of dogs, especially young ones up to two years of age. It is due to a virus with secondary bacterial infections which cause pneumonia, bronchitis, and other severe complications.

The disease is one of high fever and prostration with running eyes and nose. The discharge later becomes pus-like. The symptoms may abate in about three weeks in favourable cases, but may persist longer. Recovery may be uneventful or nervous disorders may set in. Recovery from an attack confers a lasting immunity.

When an outbreak occurs, strict isolation is essential. Good nursing, begun early and carried right through, greatly helps recovery. Quiet, well-ventilated but warm quarters should be provided, and bedding e.g. sacks with a little straw, which can be burnt, should be included. Milk and appetising foods should be given after the first few days sickness.

Where the services of a veterinarian are available, it is possible to treat an outbreak by the administration of immune serum and drugs such as sulphanilamide. If treatment is commenced early, excellent results may be obtained.

Preventive vaccination is also possible. This consists of injecting a specially prepared living virus vaccine to produce a mild case of distemper. (Such a dog is infective to others and must be isolated). At the same time immune serum is also injected. Because of the dangerous nature of this vaccine, vaccination must be carried out by a veterinarian who can keep a close watch on the subject. The dog must be healthy and should be freed of worms before vaccination. It is also possible to have show dogs protected for periods up to ten days by injecting large quantities of hyperimmune serum before contact is had with other dogs.

FOWL POX

Fowl pox (sometimes called chicken pox) is usually recognized by characteristic sores and scabs on the combs of fowls, but the virus of this disease also causes lesions inside the mouth. This manifestation of the disease is sometimes erroneously called " diphtheritic roup ", because it is not understood that it is caused by the same virus that is responsible for fowl pox. There is still another manifestation of the disease, where the birds' nasal passages, eyes and head sinuses are swollen and choked with cheesy material. These symptoms can be easily confused with those of infectious laryngotracheitis, a much more serious disease caused by a totally different virus from that of fowl pox. When in doubt about such a diagnosis, forward typically affected birds, either alive or freshly dead, to the Veterinary Research Institute, Parkville. Fowl pox normally causes only a small mortality, but laryngotracheitis is much more dangerous, and a mistaken diagnosis may be costly.

Prompt vaccination is applied for laryngotracheitis prevention, but fowl pox vaccination is not recommended by the Department of Agriculture, although it is practised in some other States. A severe reaction often follows its use, causing loss of egg production and increased susceptibility to other diseases. The Department also advises against the use of patent remedies for fowl pox on the grounds of lack of results for the expenditure involved.

It is suggested that the farmer avoid overcrowding, and feed plenty of greenstuff to his birds. Pullets and young cockerels are the chief sufferers from fowl pox and measures should be taken to safeguard these birds from direct contact with infected stock.

Turkeys are susceptible to fowl pox, but not ducks.

[D. McQueen, B.V.Sc., Veterinary Officer].

ORCHARD NOTES

Fertilizers -- Planting and Pruning of Citrus Trees
Citrus Mottle Leaf -- Spraying Stone Fruits

By G. W. GAYFORD, B.Agr.Sc., *Horticultural Instructor*

Fertilizers for Orchards

THE supply of fertilizers for orchards will be a little easier this year and orchardists will be able to obtain reasonable quantities of mixed fertilizer, potash, nitrate of soda and sulphate of ammonia. No permits will be required, but in view of the limited supplies of sulphate of ammonia, it is necessary for equitable distribution that the applications of this and mixed fertilizer on all types of fruit, other than citrus, should not exceed the following amounts:—

Spreading artificial fertilizer in the orchard.

Sulphate of Ammonia—1 bag (160 lb.) per acre.

Mixed fertilizer, 4 : 4 : 1 (4 parts superphosphate, 4 parts sulphate of ammonia and 1 part potash)—360 lb. per acre.

For citrus up to 4 cwt. per acre of *sulphate of ammonia* could be applied.

Fruit growers who require *potash* are advised to use this at the rate of 2 cwt. per acre, while *nitrate of soda* should be used in two separate dressings each of 2 cwt. per acre.

The most suitable time to apply fertilizers to orchard land is during the months of August or early September. There are several reasons for this, the main one being that a supply of nitrogen is required by fruit trees for effective setting of the blossoms. Root growth commences before the trees burst into bloom, and if the fertilizer is in the root zone, it will be absorbed by the roots and become available to the blossoms.

Another reason for the spring application is that it is necessary to plough the orchard during the early spring months. This operation provides an opportunity for getting the fertilizer into the root zone, either by distribution in the furrows or by broadcasting before ploughing and then turning under with the plough. Fertilizers such as potash and phosphates, which quickly become unavailable as plant foods in most soils, must be brought into the root zone as quickly as possible if they are to be of value to the trees. It is essential, therefore, to plough these fertilizers under as quickly as possible after broadcasting.

Where a green crop has been grown in an orchard, the application of fertilizers containing nitrogen before the crop is ploughed under will hasten its decomposition and the minerals and nitrogen will become available more rapidly to the trees. Of the equipment used for turning under green crops, the tandem disc cultivator with "cutaway" discs appears to be one of the most useful implements and has proved very satisfactory under differing soil conditions. In some orchards it has almost superseded the plough for general orchard use.

Planting and Pruning Citrus Trees

The early spring is the best time for planting citrus trees. The soil usually contains sufficient moisture after the winter rains and, with the warmer weather occurring at this time of the year, trees should quickly become established. In northern districts, hand watering of young trees is essential when the soil is dry. The success of a citrus plantation depends largely on healthy vigorous growth during the early years.

Pruning of citrus trees should also be carried out in the spring months. Regular pruning of citrus trees is not required but, in some instances it is necessary. If a tree is lacking in vigour, a thinning out of growth throughout the tree will probably result in a renewal of fresh fruiting wood. Vigorously growing young lemon trees sometimes require attention because they produce strong-growing vertical shoots which, if allowed to remain, would result in a badly-shaped tree, and a reduction in the more fruitful horizontally growing shoots. These vertical shoots should be removed at their point of origin on the main branches. Pruning should be delayed until the danger of severe frosts has passed, otherwise the resulting young shoots may be damaged severely.

Citrus Mottle Leaf

Mottle leaf of citrus trees occurs mainly in northern irrigated districts. It is characterized by a yellowing of the areas between the main veins on the leaves. When prolonged, the disease causes stunting of the tree with a dense bushy growth of small leaves. The trouble may be effectively controlled by using a spray consisting of 10 lb. zinc sulphate and 5 lb. slaked lime plus spreader in 100 gallons water. This spray should be applied before the main spring growth commences.

Citrus leaves showing typical symptoms of zinc deficiency.

Spraying Stone Fruits

Bordeaux mixture sprays of strength 6 : 6 : 40 (6 lb. copper sulphate, 6 lb. slaked lime in 40 gallons of water) should be adopted as a routine on peaches, nectarines, cherries, apricots and plums, at the "pink-bud" stage. This will assist in the control of brown rot in these fruits and will also be effective as a control of "shot hole" or "scab" in apricots, prune rust in plums and "curly leaf" in peaches.

Artificial Insemination of Cattle

Werribee District Unit

By DAVID S. WISHART, B.V.Sc., *Veterinary Officer, State Research Farm, Werribee*

Following preliminary investigations over the previous two years, an artificial insemination unit was established in June, 1945, in commercial dairy herds of grade cows in the Werribee district. The semen used in this unit is being collected from stud Friesian bulls located at the State Research Farm, Werribee, from which centre the unit is operated.

This unit was established primarily to provide information regarding the organization required for a full-scale commercial unit, and a complete report covering this aspect will be published in a subsequent issue of this Journal. The opportunity is also being taken to obtain information on the degree of efficiency which may be expected in such a unit, and this preliminary report has been prepared to give some indication of the progress of the investigation from this viewpoint, as some time must necessarily elapse before the final results of the calvings are available.

THE following report covers an analysis of the preliminary results of the insemination of the first 250 cows inseminated in the unit, and the figures set out below relate to these cows only. It must be borne in mind that these results are not final, as few calves have yet been dropped from the cows concerned.

Conception Rate

The 250 cows required a total of 419 inseminations, details of which are set out in Table 1.

These figures give a conception rate of 1·68 inseminations per conception; or, when conceptions are expressed as a percentage of total inseminations, 59·7 per cent. American workers consider that the lowest level of efficiency consistent with economy is reached at 2·0 inseminations per conception, or 50 per cent., and most reported figures fall between 1·5–2·0 (66–50 per cent.), with an average of about 1·8. In natural mating, the average number of services per conception is about 2·2.

The degree of success indicated by the preliminary results is influenced by two main factors:—

(*a*) Some of the cows were moved to "dry" paddocks before it could be definitely determined that they were pregnant, which tends to improve the results; and

(*b*) No attempt has been made to restrict the number of inseminations given to any one cow, as it seemed desirable to continue inseminating difficult cows at least in the early stages of the scheme without complicating the picture by elimination of the cow or by treatment for sterility. This policy has led to the inclusion in the preliminary figures of a number of inseminations of cows which may never conceive, and therefore reflects adversely on the results.

It appears likely that these two factors, which have opposite effects on the results, will be nearly equal in significance. If this is so, they will cancel each other, and the final result will approximate fairly closely to that revealed by the preliminary figures. The preliminary result is therefore very encouraging, as it falls very favorably within the average range.

Storage of Semen

An attempt is being made to determine the level of fertility of semen stored for varying periods. All storage of semen has been carried out after dilution (at different rates, see below) with the egg-yolk-phosphate buffer now in common use in America. Most inseminations have been done with semen up to four days old, as this period is considered to be the practical limit; the

This calf, a potential Friesian herd sire, is progeny of an artificial mating between a proven bull and an outstanding cow (average 550 lb. butterfat for nine lactations) which was unfit for natural service.

remainder have been done with semen five and six days old to obtain some indication of the level of fertility at this time.

Results in Table 2 show that, in the specimens used, there was no decrease in the level of fertility up to 120 hours of storage, while even for the few inseminations performed at 144 hours the results are not far below the average. The rather high figure at 120 hours is regarded as a purely fortuitous occurrence over a comparatively small number of inseminations.

All stored specimens were examined microscopically for activity on the day on which it was intended that they should be used. The number of such specimens rejected as unsuitable before the fourth day of storage has been negligible, but has increased from the fifth day onwards. The figures set out above relate only to the use of semen which has exhibited a satisfactory degree of activity on the day on which it was used.

The above figures indicate that, provided careful selection of the original specimens of semen (i.e., as collected) is made, semen can be regularly stored and used successfully for at least four days after collection. This compares favorably with overseas findings.

Dilution of Semen

As stated above, all dilution of semen has been carried out with the American egg-yolk-phosphate diluent. When the original trials at Werribee were commenced, the American recommendation regarding the degree of dilution was that at least three volumes of diluent were required to every one volume of semen, and for this reason the original work at Werribee was done with a dilution of 1 : 3 (semen : diluent). Since that time (1943), American workers have obtained satisfactory results with dilutions up to 1 : 30, and have recently been experimenting with dilutions of 1 : 50.

The policy adopted in the Werribee unit was that, as successful results had already been obtained at the 1 : 3 dilution, the dilution should be progressively increased to a tentative limit of 1 : 24. Results at the various dilutions are set out in Table 3.

These results agree with the American findings, and indicate that the level of fertility is maintained in dilutions up to 1 : 24. It is of interest to note that, at a dilution of 1 : 24, the average volume of semen per ejaculate (4 ml.) yields 100 ml., or 100 cow doses of diluted semen with a potential life of four days.

Time of Insemination in Relation to Oestrus

Calls are received at the centre between 8 and 9 a.m. each morning, in which hour each owner reports cows first observed in oestrus in the previous 24 hours. All cows so reported have been inseminated between 9 and 11 a.m. on the morning on which the report was received.

Records have been kept of the times at which the cows have first been seen in oestrus by their owners. As milking cows are under closest observation at milking times, most cows are first observed in oestrus at either the afternoon milking on the day prior to the day of insemination, or the morning milking on the day of insemination.

Results have therefore been grouped according to this classification:—

Cow first seen in oestrus ..	Day of Insemination.	Day before Insemination.	Totals.
Number of inseminations	240	179	419
Number successful ..	149	101	250
Percentage successful ..	62·1	56·4	59·7

It will be noticed that there is little difference between the two groups, which appears to justify the principle of a once-daily service, as compared with a twice-daily service. However, in a seasonal breeding district, where comparatively large numbers of cows have to be inseminated each day, it may not be possible to inseminate all cows on a once-daily scheme within a reasonable time of the onset of oestrus, and there may be some advantage in a twice-daily service, perhaps only in herds close to the centre.

Conclusions

The preliminary results set out above show that the practical use of artificial insemination of cattle under local conditions is being successfully established in the Werribee unit.

The preliminary conception rate obtained is very satisfactory, and includes a number of inseminations with semen which has been stored for a period slightly longer than the usual limit. The efficiency achieved in the various techniques therefore appears to be at least as high as that attained overseas.

TABLE 1.

—	Number of Cows.	Percentage of Total.	Progressive Total Percentage.
Cows holding to 1st insemination	143	57·2	57·2
Cows holding to 2nd insemination	70	28·0	85·2
Cows holding to 3rd insemination	22	8·8	94·0
Cows holding to 4th insemination	9	3·6	97·6
Cows holding to 5th insemination	2	0·8	98·4
Cows holding to 6th insemination	4	1·6	100·0
	250	100.0	100.0

TABLE 2.

Hours storage before use	0.	24.	48.	72.	96.	120.	144.	Totals.
Number of inseminations	2	91	106	103	80	24	13	419
Number successful	1	54	62	63	43	21	6	250
Percentage successful	50	59·3	58·5	61·2	53·8	87·5	46·2	59·7

TABLE 3.

Semen : diluent	1 : 3.	1 : 6.	1 : 12.	1 : 24.	Totals.
Number of inseminations	1	31	141	246	419
Number successful	1	14	80	155	250
Percentage successful	100	45·2	56·7	63·0	59·7

THE FLOWER GARDEN

Propagation of Camellias

By T. H. KNEEN, B.Agr.Sc., Acting Principal, School of Horticulture, Burnley

MANY home gardeners express a desire to propagate their own shrubs and trees, especially by methods other than the raising of seedlings, which, in many cases do not "come true" to the parent plant. There is certainly no more interesting and intriguing branch of horticulture than propagation, and once on the road to success there is no end to the pleasure obtainable from this specialized work.

Many enquiries are made concerning the methods applicable to camellias, daphnes, &c., the propagation of which requires considerable patience and experience. Actually, the methods used are simple and straightforward enough but the importance of patience is apparent when it is realized that, in the case of camellias, it will take approximately two years to secure a plant that is ready for setting out in its permanent position. By that time the gardener will have developed a respect for the nurseryman who specializes in such matters, as well as a proper appreciation of the ingredients for success, not the least of which is patience, as mentioned earlier.

There are three main methods of propagating camellias, namely, by cuttings, layers, or grafting on to seedlings. The last method involves raising strong, vigorous and healthy seedlings on to which are grafted pieces of the required variety. The graft is slow to "take" and must be done under glass with the assistance of bottom heat and, for this reason, is not a practicable method for the home gardener. Although recognized as the best method, it would be better to secure experience with one or both the other methods.

Propagating Camellias.
A. Camellia bud cutting, showing bud in axil of leaf.
B. A rooted bud cutting. The bud develops very slowly.
C. A prepared camellia cutting.
D. A cutting six months after insertion in sand.

Layering is a method suited to those who already possess a tree, the lower branches of which can be bent to the ground so that the portion just back of the tip can be covered with soil to a depth of, say, three inches. The tip itself remains exposed, develops new buds and further growth. The formation of roots in the buried portion is helped by using a sharp knife to cut the stem half way through and slitting it longitudinally, for about one inch. It is most important that the layers (several branches should be layered), be securely pegged down to prevent any movement. Regular watering throughout the year is equally essential, as the layers must never be allowed to dry out.

Most beginners are uncertain when layering should be done. In the case of camellias, July is a suitable month—it is not too late to do it now. There is no advantage in doing it earlier than July. At about the same time the following year some of the layers will have developed little balls of roots and such layers should be severed from the parent plants and grown on in pots for another year. The other layers will have formed callus tissue in the cut region but no roots—these should be replaced for another year, by which time roots will have developed. The point to notice is that at least a year will elapse before sufficient root development has taken place to enable the rooted tip to be severed from the parent plant.

Cuttings can be struck in an ordinary glass frame or under a bell glass, the inside of which must be wiped frequently. A greater measure of success will be had if a little bottom heat can be provided, plus the conditions prevailing in the glass house.

The recognized time for taking cuttings is about the end of summer, or early autumn. Many propagators are successful with less mature cuttings, taken as early as December, whilst success can be achieved with cuttings taken as late as July. Young immature growth in the spring is the least suitable. The degree of success will vary with the variety, some "striking" more readily than others. The popular Czar is a good one to propagate by this method.

The best type of cutting is a young shoot, four to five inches long, preferably with a heel, although the latter is not essential. Any flower buds (these are evident now) should be removed and the heel trimmed with a sharp knife, which should be used to remove the lower leaves leaving the top two. It is not necessary to shorten these leaves as is often done.

The rooting medium may be clean washed sand which should be neither too coarse nor too fine. If peat moss is available, quarter fill a five-inch pot with this material and finish with sand. Insert the cuttings firmly two-thirds their length in sand. The cuttings must be kept moist at all times and sheltered from hot sun.

The above is a brief outline of methods the amateur might use in propagating camellias. Not every cutting or layer will strike—50 per cent. success would be very good indeed for a beginner.

THE VEGETABLE GARDEN

Suggested Varieties for August Sowing and Planting

Vegetable.	Variety.	Seed or Plants.	Occupy the Ground for Approximately—
Carrot	Short Horn	Seed	5–6 months
	Danver's Half Long	,,	,,
	Red Chantenay	,,	,,
Parsnip	Hollow Crown	,,	6 months
Red Beet	Detroit Dark Red	,,	4–5 months
	Crimson Globe	,,	,,
Silver Beet	Dark-Green Broad-Ribbed	,,	6 months
Lettuce	Iceberg	,,	2–3 months
	New York	,,	,,
Pea	Greenfeast	,,	3–4 months
Cabbage	Parisian	Plants	5 months
Turnip	White Stone	Seed	3–4 months
Potato	Carman No. 1	,,	5 months
	Katahdin	,,	,,

Featuring in this month's sowing programme are a number of root crops, which, although hardy, cannot be grown satisfactorily during the winter months. Carrots, parsnips, red beet and turnips need favorable growing conditions if they are to produce roots of good quality. In addition to these root crops, early varieties of potatoes may be sown in districts where the frost risk is decreasing. Silver beet, lettuce, and pea sowings may be continued with advantage using the varieties suggested in the sowing guide on this page.

Many gardeners attempt to grow early tomatoes, but in the metropolitan areas it is better to defer planting until September or October, in order to reduce the incidence of the many diseases affecting tomatoes. It is much too early to sow crops such as French and climbing beans, cucurbits (pumpkins, &c) and sweet corn—these are definitely tender crops, the sowing of which should be deferred until October. Meanwhile, attention should be given to the root and leaf crops already mentioned.

The root crops are best grown on ground that was previously heavily manured for leaf crops. Carrots and parsnips will require ten inches or so of well-drained soil for their best development. A suitable fertilizer mixture for these crops, incorporated during the soil preparation stage, is 1 oz. of superphosphate and ½ oz. of sulphate of ammonia per square yard.

Early sowings of carrots present difficulties because of aphis attack which is responsible for the spread of carrot virus disease. Carrots must be dusted with nicotine dust from the time the seedlings appear to reduce aphis infection, and dustings must be repeated at intervals of three weeks until the end of November, after which time aphis attack is unlikely. The alternative is to grow a virus resistant variety such as *Osborne Park* which, however, is not of as good a quality as the well-known *Red Cored Chantenay*.

It should be remembered that parsnip seed is good for only one year and, therefore, fresh seed is essential for this crop. The four crops mentioned are sown where they are to remain and thinned out to the required distance later.

FROST INJURY TO FLAX

By C. R. MILLIKAN. M.Agr.Sc., *Senior Plant Pathologist, Biological Branch*

IN Victoria the bulk of the flax crop is normally sown during the period from approximately mid-May to mid-July each year. It is, therefore, not unusual for instances of frost damage to flax to occur during the winter and early spring months. In general the damage caused by frost has been slight, and some growers apparently have been unaware that the symptoms exhibited by the affected plants in their crops were, in fact, the result of frost injury. This is no doubt due to certain features associated with its occurrence. One is the manner in which the affected plants are usually distributed through the crops. It is most unusual for instance to find a large and continuous area of plants all injured by frost. Affected plants are usually found individually, or in small isolated lengths of drill row, which are random in distribution and often appear to be unrelated to any local variations in either contour or soil type. Such patches are surrounded by healthy plants, and often there are individual healthy plants interspersed among those damaged by frost. A variation in the severity of the symptoms manifested by the frosted plants may also occur. Young plants in thickly-sown patches appear to be more subject to frost injury than those normally-spaced.

Fig. 1.—Flax seedlings showing severe frost injury. In most instances the base of the stem (hypocotyl) is unaffected.

Another feature of the incidence of the disease is that the age of the young flax plant has an important effect on its susceptibility to frost injury. Instances have occurred in the field in which the flax plants in one portion of a paddock have been 3 to 4 weeks old and with a number of leaves, while other later sown plants on an adjacent area in the same field have been under a week old and still in the cotyledonary stage at the time the frost occurred. In such cases, the young plants have shown some frost injury, while the older plants remained unaffected. From this it would appear that the young flax plant rapidly passes from the susceptible stage into one where it is relatively tolerant to the frost temperatures normally experienced in Victoria. This is doubtless the reason why frost injury is not more widespread and severe in this State. Further information on the age of the flax plant in relation to its susceptibility to frost injury is presented hereunder.

Symptoms

The following are the symptoms of frost injury which have occurred in the field, or which have been produced in plants subjected to low temperatures in the laboratory. The varieties concerned in all instances have been Liral Crown or Concurrent.

Fig. 2.—Enlarged view of flax seedling showing severe frost injury.

Symptoms have been observed in plants at all stages of growth. In seedlings severely injured in the critical cotyledonary stage, the cotyledons (or "seed" leaves), or the whole of the hypocotyl (or stem) become dark olive-green in colour and water-soaked in appearance immediately after the frosting. The colour soon changes to a light brown, as the dead tissues dry out and shrivel (Figs. 1 and 2).

In cases of milder frost injury, one or both of the cotyledons only may become wholly necrotic, or be partially affected from the tip (Fig. 3). In such mild cases the growing point of the plant is not killed, and the development of the plant can continue.

In all instances where mildly or severely frosted seedlings have been examined shortly after the development of the above symptoms, the roots have appeared quite normal, even though the whole of the above-ground portion of the plant is dead.

The symptoms in seedlings described above differ somewhat from those recorded by Davis (1923) in that he found that the hypocotyl was affected first, and that the cotyledons as well as the root systems may be affected only indirectly. The lesions on the hypocotyl were also described as being purple in colour.

Other symptoms have occurred in older plants usually over about 6 inches in height. In cases of mild injury a few to practically all of the leaves of the plant may be killed (Fig. 4), but the stem and growing point may remain undamaged. The older or lower leaves appear to be more susceptible to frost injury than the youngest leaves. Dillman (1941) has also made the general observation that the younger tissues and leaves of the terminal bud of the flax plant were more resistant to frost injury than were the older leaves on the stem.

In more severely affected plants, extensive areas of the stem from the base upwards may show a reddish or dark-brown discoloration. Where the stem is not woody, it collapses, and the top of the plant hangs vertically down (Figs. 4 and 5). The dead plants are usually brittle, and there often appears to be a gummy secretion in the dead stem tissues.

It is not uncommon to find plants in the field showing the brown discoloration on one side only of the lower half of the stem.

When severe frosts occur after boll formaion, the latter become dark-brown in colour and the partly formed seeds inside are later rotted by saprophytic fungi.

Factors Affecting the Susceptibility of Flax to Frost Injury

It is known that flax varieties differ in their susceptibility to frost injury (Davis 1923, Dillman 1941). Certain linseed

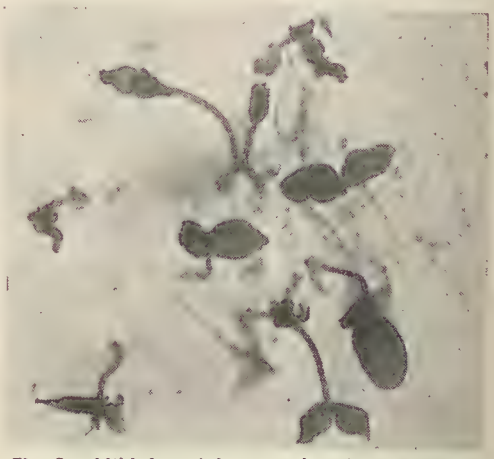


Fig. 3.—Mild frost injury produced in flax seedlings subjected to a temperature of 30° F. for 40 minutes. The symptoms are confined to varying degrees of necrosis of the cotyledons from the tips.

Fig. 4.—Young flax plants subjected to a temperature of 8° F. for 30 minutes, showing the marked differences in resistance of individual plants. The plant on the right was unaffected.

varieties, namely Roman Winter, Rio, Rigor, and Bolley's Golden are reported to be tolerant of cold temperatures, whereas, the fibre flaxes are less hardy.

However, amongst these less hardy varieties there appears to be a considerable variation with age in their tolerance of cold temperatures. Dillman quotes instances in which flax plants 2 to 6 inches tall at the time of a severe freezing (9–12° F.) were not injured greatly, whereas, taller plants were frozen back to the crown buds. However, plants about 6 inches in height, but in a very succulent condition, were almost completely killed by a temperature of 14° F. followed by three nights with minimum of 16°, 20°, and 22° F. respectively. Very young seedlings in the two-leaf (or cotyledonary) stage were also severely injured.

Laboratory Experiments.

To obtain some local information on the effects of the age of the plant and of soil waterlogging on the resistance of flax to low temperatures, the following experiments were conducted :—

Method.— An experiment was made in which pots containing Concurrent seedlings in the two-leaf or cotyledonary stage were placed in experimental chambers and maintained at the following temperatures respectively—

23° F. for 1 hour,
30° F. for 40 minutes.

Further pot experiments were conducted in which two sowings of Concurrent flax were made, the times of sowings being so spaced that there were pots available when required in which the flax plants were either 12 to 15 inches or 4 to 5 inches in height respectively. Some pots of plants in the taller series were waterlogged for three weeks immediately prior to the test. Pots from each series were then placed in experimental chambers and subjected to one of the following low temperatures —

8° F. for 30 minutes,
25° F. for 2 hours,
31° F. for 2½ hours.

Results.—Seedlings in the cotyledonary stage were severely injured by a temperature of 23° F. for one hour, both the cotyledons and hypocotyls being affected. At 30° F. for 40 minutes only an occasional plant was affected, the damage being confined to the cotyledons (Fig. 3).

Some striking differences were obtained in the experiments with the taller plants. After being subjected to a temperature of 8° F. for 30 minutes, the tall plants (12 to 15 inches high) were completely killed irrespective of whether they were waterlogged or not, whereas, only about 15 per cent.

Fig. 5.—Severely frosted flax plants collected in the field.

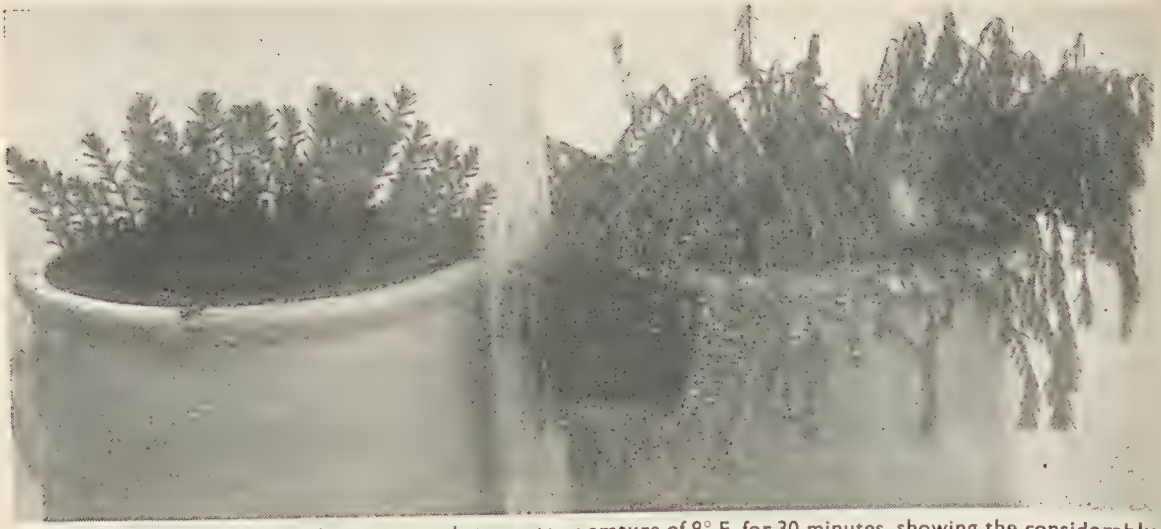


Fig. 6.—Concurrent flax plants exposed to a temperature of 8° F. for 30 minutes, showing the considerably greater cold resistance of the young plants (left) compared with the older plants (right). Plants in pot on left completely succumbed when re-exposed to a similar temperature after they had attained a height of approximately 12 inches.

cent. of the younger plants (4 to 5 inches tall) were affected, and of these not all were completely killed (Figs. 4 and 6). These surviving young plants were allowed to grow until they had reached a height of 12 to 15 inches and were then re-subjected to a temperature of 8° F. for only 20 minutes when they were all completely killed.

A temperature of 25° F. for two hours caused no injury whatever in the old (12 to 15 inches tall) not-waterlogged plants, and the young (4 to 5 inches tall) plants, whereas the old waterlogged plants showed some injury.

The exposure of the plants to a temperature of 31° F. for 2½ hours caused no injury to any of the series.

From these results the following general conclusions are drawn. The flax plant is most sensitive to frost in the two-leaf or cotyledonary stage. From this stage until it is at least 4 to 5 inches tall it rapidly becomes very resistant even to very severe cold, but with increasing age it again shows some sensitivity particularly to severe frost. This sensitivity to frost is increased by waterlogging of the soil in which the plants are grown.

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By RUTH BROMFIELD, *Fruit Preserving Expert*

The welcome reappearance of grape fruit and the bitter marmalade oranges in the fruit shops after a long absence will be welcomed by those housewives who believe that the best marmalades can be made only from the recognized marmalade citrus fruits.

FOR any of the marmalades, select fruit even in colour and free from skin blemishes. The most popular fruits for marmalade are the Seville and Poorman oranges and grapefruit. Sweet oranges are often used, but the marmalade made from this variety of fruit is too mild for some palates. The fruit should be scrubbed before use as washing alone will not remove dust, which is one of the causes of cloudy marmalade.

The underlying principles of marmalade making are the same as in jam-making, but the peel of the citrus fruit requires longer cooking than the skin of softer fruits; therefore more water has to be added to cook the peel and the boiling has to be continued for a much longer period. The pectin of citrus fruits is found in the pith; the acid is present in the juice, while the bitterness lies in the oil cells in the skin and the pith. Pectin and acid must be present in the correct proportions to form a gel when combined with sugar. It is advisable therefore, when the fruit has not been picked immediately prior to making the marmalade, to add extra lemon juice to make up for any possible deficiency as the jellying properties deteriorate in storage. The lemon juice should be added at the beginning of the cooking period.

To remove the excess bitterness from the pith, soak the peel in cold water overnight. Then replace this water by the amount of water specified in the recipe. When it is more convenient to complete the cooking process in the one day, most of the bitterness will be removed if the peel is covered with boiling water and left for 2 to 3 hours, prior to cooking.

GENERAL METHOD OF MAKING MARMALADES

Thoroughly cleanse and weigh the fruit. Halve each orange and remove the centre core or rag. The inclusion of this spoils the appearance of the finished product by appearing as thick white lumps. Quarter the fruit and take out the pulp. Cut the peel as finely as possible. Put in an earthernware bowl and cover with water and leave overnight. Next day, add the

finely cut pulp and the given amount of water to the drained peel. *Allow 1 quart of water per pound of fruit when bitter citrus fruits are used; that is, Poorman, Seville oranges or grapefruit; and 1 pint of water to sweet oranges and lemons.*

Simmer the peel, pulp and extra lemon juice (juice of 1 lemon to 2 lb. fruit) in the water until the peel is soft. Keep the lid on the pan. This cooking of the peel should be very slow, with contents of the pan barely simmering. About two hours are necessary for this part of the process. Then measure by cup and add an equal quantity of sugar.

When the sugar is quite dissolved, remove the lid from the pan and boil the mixture rapidly until the setting stage is reached. It should take no longer than 30 minutes. The setting stage may be ascertained by dipping the stirring rod into the mixture, then holding it up horizontally on its side and watching the drops as they fall. If the marmalade is ready for bottling, these drops will fall heavily in sheets or flakes. An indication to commence testing is when the mixture bubbles up in the pan.

Prolonged boiling of the marmalade after the sugar has been added should be avoided for it not only spoils the flavour and darkens the colour, but also effects the pectin contained in the fruit and causes loss of jellying properties.

When the setting stage has been reached, lift the pan off the fire and allow the contents to cool slightly before bottling. If the marmalade is bottled too hot, the pulp will rise to the top of the jar, leaving clear jelly at the bottom.

Have the containers, clean, dry, and hot. Seal when cold.

Jellied Peel Marmalade

The difference in the method of making jellied peel marmalade varies from that described above, in that the pulp need only be cut up roughly, and is then tied in a piece of cheese cloth which is placed in the pan with the finely-cut peel and water. When the peel is cooked and the sugar is about to be added, the bag of pulp is removed, after the juice has been squeezed from it. Measure the juice and peel and add an equal quantity of sugar. Boil rapidly until setting stage is reached as described above.

Marmalade for Kitchen Use

A practical way of making marmalade without detracting from the flavour is described hereunder. Quarter the fruit and remove the seeds. Put through the coarse cutter of the mincer, being careful not to waste any juice. Cook with 1½ pints water to each pound of weighed fruit for 1 hour, or longer if the peel is not softened in that time. Add an equal measure of sugar and boil rapidly until setting point is reached.

N.B.—If a mild flavour is preferred, before mincing the fruit, the whole fruit may be placed in a bowl and sprinkled with 2 tablespoons of bicarbonate of soda to about 6 oranges and covered with boiling water. Leave until cold. Proceed according to recipe.

Kumquat Marmalade

Weigh the fruit, scrub and put in a bowl. Sprinkle with 2 tablespoons of bicarbonate of soda and cover with boiling water. Leave until cold and rinse. Halve the kumquats and remove the seeds. Mince the fruit, taking care to save all juice. Put in a pan and add the juice of 1 lemon to 2 lb. fruit and 1½ pints water to each pound of fruit. Simmer for 1½ hours. Measure and add an equal quantity of sugar. Boil rapidly until setting stage is reached. Bottle and seal when cold.

Galop Jam

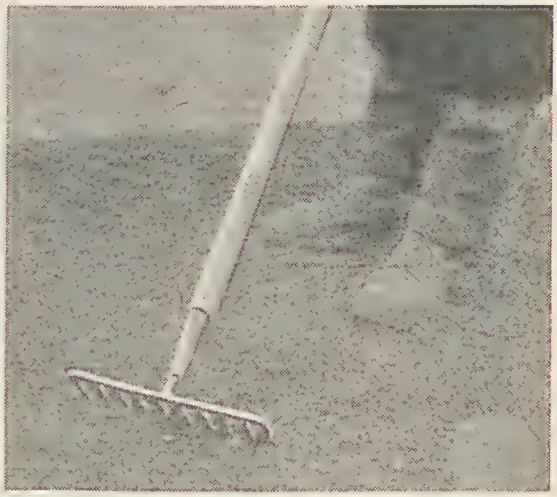
Grapefruit, apple, lemon, orange, pineapple.

Skin the citrus fruit; cut up the orange, lemon, and grapefruit, peal and soak overnight. Next morning, cut up apple, pineapple, and pulp of orange, lemon, and grapefruit. Allow 1 cup of water to each cup of fruit and peel and cook altogether till tender (about 1 hour.) Then measure and add 1 cup of sugar to each cup of pulp. Dissolve sugar and boil rapidly until it is thick. Bottle and seal when cool.

Carrot and Lemon Marmalade

Slice 7 large lemons thinly, rejecting the pips. Grate a large carrot about 1 lb. in weight on a coarse grater. Allow 6 lb. sugar and 6 pints water. Put lemon, carrot, and water in pan with 3 tablespoons of extra lemon juice. Bring slowly to boil and simmer for 1 hour. Add sugar and stir till dissolved. Boil rapidly until setting stage is reached.

N.B.—Poorman, Seville oranges or grapefruit may be substituted for the lemons The weight of the citrus fruit should be 2½ lb.



Left.—Break down clods with cultivator or fork. Right.—Rake to a fine tilth and keep surface level before sowing the seed.

[After W. Brett.]

the hot weather it is a good plan to sow them at the bottom of a wide, shallow trench, and then cover with a board. If the soil was well moistened at planting, little or no watering will then be necessary until the seedlings appear when the covers should be immediately removed. Perfectly straight rows are essential to allow the use of a hoe for later cultivation. Always use a planting line or a straight-edged board. The latter has the advantage that it may be walked upon without unduly compacting the surface soil.

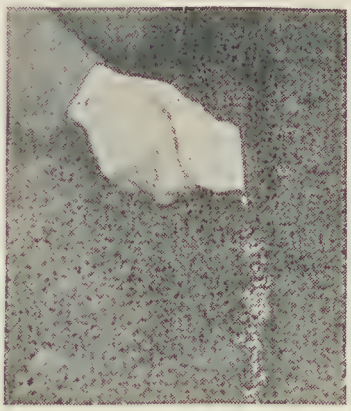
Sowing in cloddy or lumpy soil is bound to result in some loss. See that it is broken down to a fine tilth and has been watered well before sowing, but do not sow in sodden ground in the colder months. In the summer, utilize the occasional rainfalls for sowing as far as possible and at any time never let the surface dry out until the seeds are well through.

Rotation of Crops

Growing similar crops on the same ground in succession should be avoided. It tends to cause the plant foods in the soil to become unbalanced and to spread disease. A proper rotation will help to maintain the fertility of your garden and suppress disease.

The ideal sequence of crops on a plot is:—

(1) Leaf crops, tomatoes and vine vegetables—using stable manure or compost, if available.



Left.—Correct way to make a drill; keep the bottom level. Centre.—Don't sow the seed direct from the packet, but dribble in by hand (right).

[After W. Brett]

(2) Root crops—avoid using stable manure; use superphosphate.

(3) Legumes—use superphosphate only, dig in plants after picking pods.

Then start again at the leaf crop. Avoid using crops of the same type or of the same family on the same plot twice in succession; for instance, do not follow carrots with parsnips, cabbages with cauliflowers, onions with leeks, tomatoes with potatoes.

Thinning

Thinning of the rows when necessary must be carried out at the proper stage of growth. This stage and the correct distances between plants left are given in the tables. Two thinnings are sometimes necessary. Thin carefully to avoid disturbing the plants left, and water well immediately afterwards. You may transplant the thinnings from silver beet, onion, leeks, and lettuce. Thinnings from carrots and parsnips should be discarded. Red beet thinnings may be used to fill gaps in the row.

Transplanting Seedlings

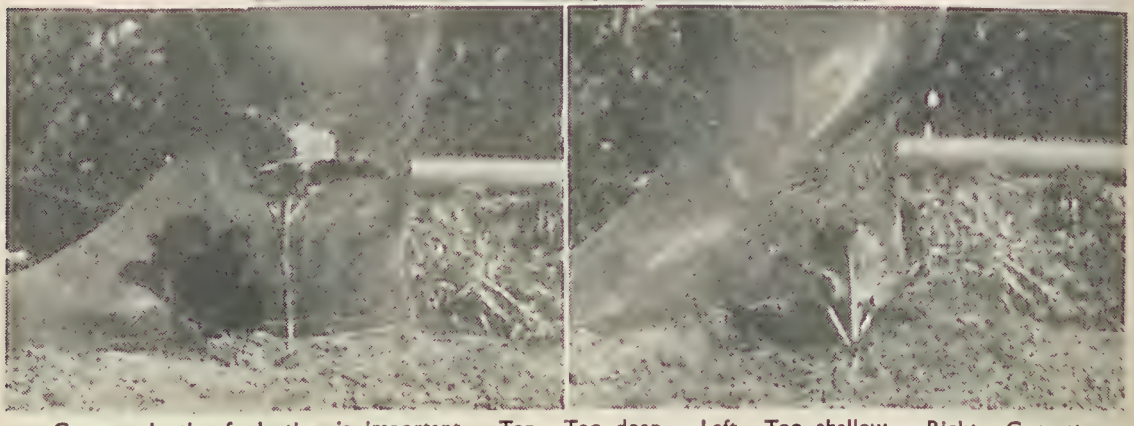
Use well-developed seedlings and plant in the cool of the evening. Keep as much soil on the roots as possible. For convenience in planting arrange tall seedlings, such as cabbage, cauliflower, and onion, in a bundle so that the bases of their stems are level. Then with one cut of a sharp knife trim the roots to a uniform length. The correct depth of planting is important: too deep and too shallow planting are equally undesirable. Most seedlings should be planted so that the stem of the lowest leaf is brought to ground level. After planting, firm the soil round the plants and water, preferably with a solution of ½ oz. of sulphate of ammonia or nitrate of soda and 1 oz. of superphosphate per gallon of water or very weak liquid manure applied with a watering can. In hot weather, shelter transplants with, for instance, small flower pots, if available, or pieces of brushwood.

Cultivation

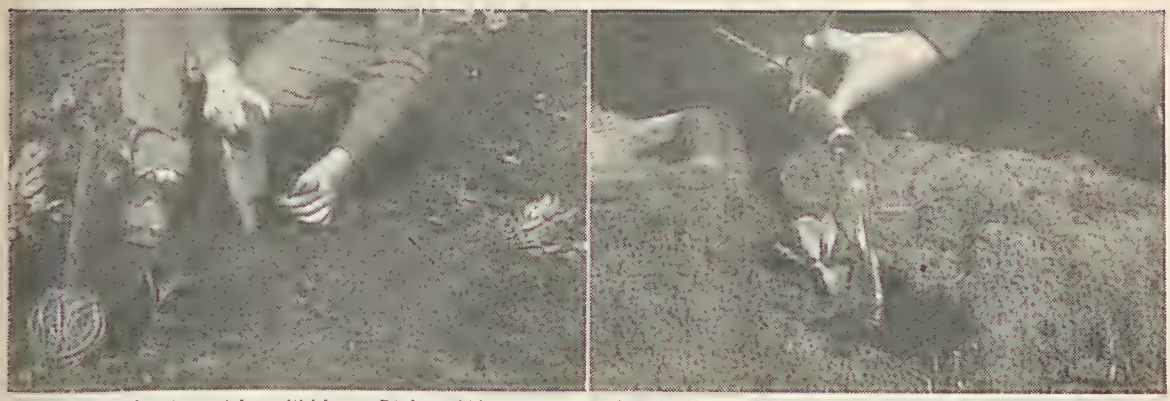
Keep weeds down and the soil surface loose by light cultivation with a Dutch hoe when necessary. A surface mulch of stable manure or lawn clippings will assist. Do not use a cultivating implement within an inch or two of the vegetables or they may wilt, due to the surface roots being damaged. Closer weeding must be done by hand.

Deep cultivation between rows of growing crops is not desirable.

It is most important to remove weeds while still small rather than to allow them to develop extensive root systems, the growth and removal of which



Correct depth of planting is important. Top.—Too deep. Left.—Too shallow. Right.—Correct.



Left.—Planting with a dibble. Right.—Watering immediately after planting consolidates soil around roots.

interferes with the roots of the vegetables. In most soils, if weeding is done at this early stage, the work may be considerably lightened by scraping the weeds carefully away using, say, an old table knife. This will be found much quicker than pulling by fingers and thumb.

Weeds compete with your crops for moisture and plant foods. Remove them as soon as they appear.

Manuring During Growth

If the growth of leaf crops, beetroot or tomatoes slackens before maturity, work in an ounce per square yard of sulphate of ammonia or blood manure. In the case of silver beet and Chinese cabbage and other vegetables which produce over an extended period, half an ounce of sulphate of ammonia or its equivalent per plant every month or so may be found necessary. Rapidly growing plants like lettuce will benefit from lighter but more frequent applications. Do not work in manure within 6 inches of the stems of the plants.

Liquid manure, either 1 oz. of sulphate of ammonia or nitrate of soda per gallon or a weak extract from animal manure, is also a good stimulant. Apply with a watering can about once a fortnight and if the leaves are splashed, water them lightly with a fine hose to wash off the fertilizer.

Mulching

Mulching the beds with a layer of rotted manure or compost, particularly in the hotter months, helps to retain moisture and prevents the burning of surface roots. In addition, a mulch will reduce the labour of weeding. Any litter can be used for this purpose, but the use of compost as a mulch also acts as a stimulant to the growing crop, and when harvesting is complete it will form a source of humus when the plot is dug over for the next crop. Where water is scarce, mulching is essential.

Pest and Disease Control

Measures for pest and disease control are shown in tabulated form in the appendix to the last instalment of this series. Fungicides and insecticides should be applied mainly as a preventive rather than a cure after the damage has appeared. Regular routine applications from the seedling stage to maturity should be applied. The cost in labour and material is small compared with the value of the crops, and there are few diseases or insects that are likely to appear on crops grown in properly prepared fertile soil that cannot be easily controlled by systematic spraying or dusting. For vegetable crops, dusts are preferred to sprays as they are more easily applied and retained on the undersides of crops with low-growing foliage. Every garden should be equipped with a duster or spray pump and ample supplies of material on hand, for use when required.

This is the first of a series of articles on the growing of vegetables in the home garden. Further instalments will appear in subsequent issues of the Journal.

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the Journal of Agriculture.

Application forms obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder :—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orphington.

Owner.	Breed.	Number of Birds.
Abikhair, Leslie, 41 Wilfred-road, Ivanhoe	A, B	32
Adams, A. E., Toolleen, via Heathcote	A, B	680
Ashgrove Stud Poultry Farm (Dr. S. Crawcour), Mountain-road, Cockatoo	A, B, D, E	3,012
Bantick, K., Old Dandenong-road, Heatherton	A, B	1,363
Barastoc Experimental Farm, Croydon P.O., (Manager, R. Canning)	A, B	988
Bassett, R. A., South Muckleford	A, B	142
Bartlett, N. M., Pimpinio	A, B	324
Batey, L. J., Katandra North	B	1,206
Batey, R. F., Invergordon South	A	1,412
Becker, F. W., Follett-road, Cheltenham	A, B	559
Bray, J., 18 Hotham-street, Warrnambool	A, B	72
Buchanan, R. O., Diamond Creek	B	2,384
Cakebread, H., Shady Creek, Buln Buln	B	251
Cannings, P. G., Shepparton East	B	2,587
Chapman, Mrs. E. E., Youanmite	A	316
Christie, R. R. & Son, Bentleigh	A, B, C	587
Cocks, W. C., Newton-street, Preston	A, C	548
Coleman, A. J., Mountain-highway, Bayswater	A, B	141
Colquhoun, Dr. W. L., "Aringa," Ringwood	A, B	194
Corbett Bros., Noel-avenue, Macleod	A	2,164
Coulson, Frank, Monbulk	B, C	226
Counsell, A. J., Koomba-road, Wantirna	A	503
Coupar, J. E., Box 18, Nathalia	—	813
Cracknell, D. M., Alma-road, Panton Hill	B, C	1,052
Cumming, H. D., "Jellalabad," Darlington	A	69
Davey, A. R., Stellavale Stud Poultry Farm, Sellars-street, Greensborough	A, B	1,237
Davidson, Mrs. A. C., 22 Sherbrooke-avenue, Ringwood	A, B	142
Davies, L. F., Ireland-road, off Westall-road, Springvale	B, C	2,056
Dawson, L. J., "Hillview," Eversley	A, B	1,191
Dawson, R. G., Maldon-road, Castlemaine	B	1,442
Dent, A. T., Sellars-street, Greensborough	A, B	1,592
Dookie Agricultural College, Dookie	A, B	897
Edwards, J., High-street, Wedderburn	A, B, C	292
Ellett, Mrs. A., Island-road, Koo-wee-rup	A	152
Emmott, E. & T., Inglewood	A, B	283
Evans, J. W., Nathalia	B	1,142
Fellows, J., Yan Yean-road, Plenty	A, B, C	830
Ford, J. V., 11 Barker-av., Shepparton	B	535
Gage, K. L., Clarke-road, Springvale	A, B	444
Gedye Bros., Railway-road, Blackburn	A, B	4,799
Giarrusso, G., Lower Dandenong-road, Braeside	B	770
Gibbs, J. L., Main-road, Lower Plenty	A, B	40
Gibbs, Mrs. M. M., Yan Yean	C	71
Gilchrist, W. J., Rossiter-road, Koo-wee-rup	A, B	2,688
Gillespie, Mrs. L., Katamatite	A	128
Giovanetti, G. E., Skene-st., Kennington	A, B, C, D	385
Graham, C., Portarlington	A	88
Grayling, C. L., Marshall Free Bag, via Geelong	A, B	3,273
Grenville, G. W., Springvale South	A, B, C	3,087
Grosvenor, E. W. & E. K., Springvale South	A, B, C	574
Gwyther, R. P., Valley-road, Highton	A, B	799
Hall, R. H., Wal Wal	A, B	884
Hall, W. S., Lyndhurst	A, B	955
Harding, T., Thomastown	A, B	3,518
Harrington, W. H., Golden Square	A, B	1,673
Harrison, Mrs. A. M., Cobden	A, B	93
Hayes, R., Mt. Dandenong-road, Montrose	A, B	739
Henderson, C. W., Shepparton East	A	567
Henderson, W. R., 22 Chesterville-road, Cheltenham	A, B	110
Hewett, A. T., Central-avenue, Bayswater	A, B	1,349
Hollis, C., Donald	B	362
Hopkins, C. A., 13 Knight-street, Shepparton	A, B	1,037
Howard, A. P., Black Hill-road, Kyneton	A, B	1,299
Hurst, H., Eltham Hatchery, Eltham	B	1,583
Jenkins, A., Ridge-road, Kallista	A, C	524
Kemp, H. L., Whitehorse-road, Ringwood, East	A, B	590
Kerr, J. J., Clarke-road, Springvale	B	1,422
Keyte, A. M., Private Bag 6, Natimuk	A, B	422
Kidgell, L. L., Willowburn Poultry Farm, 34 Mullum-road, Ringwood	B	648
Kostos, D., Waverley-road, Oakleigh	A, B	1,839
Lang, John, 46 Dundas-street, Thornbury	E	74
Latta, H. J., Langwarrin	A	1,557
Lowe, G., "Blackwood Dell," Lillico	A, B, C	367
Lucas, G. & De Molnar, F. M., 4 Downing-street, Blackburn	B	1,923
McCabe, R., Gladstone-road, Dandenong	A, B	1,921
McDonald & Ellen, "Rossmoyne" Pig and Poultry Farm, Avoca	A, B	4,509
McDonald, R. A., "Barton," Moyston P.O.	A	122
McKinnon, M. L., Yielima, via Nathalia	A, C	425
McTighe, C. H., Nar Nar Goon	A	444
McVay, A., Kernot-street, Spotswood (Ruskin Poultry Farm and Hatchery)	B	2,637
Mackintosh, W. C., "Clearview," Neerim South	A, B, C, D	974
Major, C. D., Simpson's-road, Eaglehawk	A, B	582
Mead, J. L., 28 Golf Links-avenue, Oakleigh	A, B	209
Meaklim, R., Mooroopna	A	110
Messenger, C., 240 Rathmine-street, Fairfield, N.20	A, B	160
Micell, M., Monbulk	B	402
Mitchell, R. J., Alkooma Poultry Farm, Macleod	A	1,095
Molson, W. E., Blackburn	B	886
Moore, H. A., Warrandyte-road, Ringwood North	A, B	897
Morgan, P. D., Willaura	A, B	298
Moroney, J. B., Kangaroo Flat	A, B, C	1,673
Muir, J., Quabba Poultry Farm, Ringwood	B	1,239
Mumford, L. J., Steele-street, Healesville	A	400
Nemet, P., Springvale-road, Springvale South	B	2,622
Nichols, Mrs. Ella M., Yan Yean	C	543
Niewand, F. J., "Kalang," Lubeck	A, B	906
O'Shea, J. M., Avoca	A, B	284
Overman, C. J., Vernal-avenue, Mitcham	B, E	1,623
Owen, H. T., Ashlyn Poultry Farm, Chum-road, Healesville	B	604
Paton, W. S., Glenburnie-road, Mitcham	A, B	528
Poulton, A. W., Vickers-street, Sebastopol	A, B	1,687
Power, M. J., 8 Danin-street, Pascoe Vale	A, B, C	858
Rae, J., 277 Albert-street, Sebastopol, Ballarat	B	1,965
Rees, H. F., "Wharepuke," Panton Hill	B	719
Reher, P., Holmeglen Poultry Farm, Burwood	A	2,125
Rerden & Stokes, Victorian Poultry Products Pty. Ltd., Central-avenue, Bayswater	A, B	1,934
Riddell, M., Main-road, Doncaster East	B	866
Robertson, D., 70 Somerville-road, Yarraville	B, C	56
Rodgers, C., Panton Hill	B	97
Rowe, D. and L., "The Wattles," Wal Wal	A	448
Salathiel, R., Lockwood-road, Kangaroo Flat	B	642
Salmond, J. B., Deer Park	F	245
Sanders, A., Stud-road, Wantirna	A, B	428
San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,451

Owner.	Breed.	Number of Birds.
Sargeant, E. G., 261 O'Heas-street, Pascoe Vale	B, C	189
Scales, J., "Eellam," West Wattletree-road, Boronia	A	1,485
Scouller, R. C., Tarrant-street, Cobden..	A, D	375
Smith, E., Valley-road, Highton ..	B	1,505
Smith, H. A., Marong-road, Malden Gully	B	1,391
Smith, K. M., Panton Hill	B, C	1,394
Smith, W. T., Panton Hill	A, B	1,759
Stant, F. E. and W. J., Springvale Chick Service, Springvale	A, B, C	4,218
State Research Farm, Werribee ..	A, B	1,176
Stiles Bros., Fair View Poultry Farm, Wallan	A, B	1,262
Stoneman, J. W., Carlella Poultry Farm, Campbell's-road, Briar Hill ..	C, F	151
Streeter, H. A., Avoca	B	508
Sweeney Bros., Tarara Stud Poultry Farm, 55 Rundle-street, Ararat	A, B	929
Swift, D. A., Kangaroo Flat	A, B	2,226
Taylor, H. R., 119 Rathgowan-road, Reservoir, N.19	A, B	2,519
Walton, F. R., Woodvale-road, Boronia	A, B, C	403
Wanliss, W. J., Springvale-road, Springvale South	A, B	1,248
Watson, W. K., Greenvale-road, Somerton	B	201
Watters, N. J., 6 Alpine-grove, Pascoe Vale	A, B, C, E	139
Waugh, A. J., Kangaroo Flat ..	A, B	1,509
Webb, A. E. H., Frankston-road, Cranbourne	A, B	6,315
Welch, T. A., Bayswater-road, Bayswater	B, G	2,787
Wernli, J. H., Cheltenham	A, B, D	649
Wesley, J. H., "Fairview," Kangaroo Flat	B	2,226
Wheeler, F. R., c/o Mental Hospital, Ararat	A, B	90
Whitham, R. S., 28 Neville-street, Glenhuntly	A, B	132
Williams, V., 91 Tone-road, Wangaratta	A, B	726
Wimhurst, J. C., Private Bag, Tongala ..	B	474
Winter, G. S., Murgheboluc	A, C	714
Wohlers, S., Box 17, Jung	A	261
Wright, A., Wunghnu	B	923
Yates, W., 64 Bank-street, East, Ascot Vale	A	35
Youl, R. S., Wycherley Stud Poultry Farm, "Wycherley," Wedderburn	A, B	1,674

LIVER FLUKE

The common liver fluke is a parasite of sheep, cattle and rabbits. In its mature stage it is found in the bile ducts of the liver. Eggs produced by the female fluke pass down the bile duct to the bowel and thence out with the droppings. The eggs need moisture and warmth to hatch, but they can survive in damp places and will lie dormant till the spring-time when hatching occurs.

For further development, the larval fluke must find a certain fresh-water snail. When available, these snails are invaded by the fluke and about fifty days are spent in them. The fluke then escape and encyst on weeds and grass to await the arrival of the host.

After being swallowed by sheep a small fluke burrows its way into the liver where it wanders actively around for about six weeks. It then enters the bile duct where it grows to maturity. During this active burrowing stage, fat sheep may die from acute fluke infection due to liver damage. These animals stand apart for a few days; their abdomen may be distended and painful. Death occurs quietly. On opening, the abdominal cavity may be full of blood-stained fluid and the liver may appear enlarged and crumbly on the surface.

Black disease is associated with liver damage due to immature fluke. Sheep are found dead and show yellowish patches on the liver. The heartsac may be full of straw-coloured fluid.

The chronic form of fluke infection is more common. When so affected, sheep die usually nine to twelve months after picking up the disease. The sheep appear pale, anaemic, listless and show bottling of the jaw. They usually die in winter and on being opened mature fluke will be found in the thickened bile ducts.

Treatment consists of a dose of 1 c.c. (half in lambs) of carbon tetrachloride in 4 c.c. of paraffin oil usually given in June, by which time fluke are fully developed. Two doses—one in May, and one in July—may be necessary in heavy infection.

Survival of fluke depends on its two hosts, the snail and the animal (sheep, cattle, or rabbit). Spelling a paddock is not very effective owing to the fact that eggs and encysted fluke survive a long time and rabbits act as hosts.

Treatment of streams and marshy areas with bluestone will destroy the snail and thus control fluke. Drainage of boggy areas is recommended. Powdered bluestone and sand—25 lb. bluestone to 100 lb. of sand well mixed, is sufficient to treat 1 acre of snail-infested pasture. In actual use one sprinkles powder only around swampy areas, edges of pools, dams, &c. In addition to broadcasting this mixture, hang small bags of bluestone on sticks in all dams, ponds, streams, &c., to which sheep have access.

[D. M. Flynn, B.V.Sc., Veterinary Stock Inspector.]

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS.

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.	Name.	Address.	Number in Herd
Aboriginal Station	Lake Tyers	86	Maybery, A. H.	Horsham	16
Armstrong and Son	Wangaratta	105	Middleton, J. A.	Longwarry North	70
Ballarat Orphanage	Ballarat	116	Murray, M. G.	Lima	26
Banyule Stud Pty. Ltd.	Wangaratta	55	McIntosh, J.	Merrigum	35
Beggs, A. R.	Beaufort	116	McKenzie, A. E.	Kerang	54
Black, I. S., Estate	Mount Noorat	59	McNabb, G. A., and Son	Irrewillipe East	159
Bleakley Bros.	Horsham	16	Nancarrow Bros.	Kerang	48
Carne, W. J.	Pakenham Upper	27	Nicholas, M. A.	Sherbrooke	78
Clark, W. J.	Monomeith	148	Noonan, G.	Benalla	35
Cowan, G. L. S.	Bacchus Marsh	59	Noonan, Mrs. S. A.	Benalla	51
Cribbes, T.	Wangaratta	39	Northcote Children's Farm	Bacchus Marsh	48
Deering, J. T.	South Wangaratta	86	Onley, W. H.	"Glenholme," Caldermeade	58
Dennis, Mrs. A. A.	Frankston	23			
Dookie Agricultural College	Dookie	92	Parker, Mrs. L. M.	Tallarook	67
Everist, F. R.	Tyabb	20	Payne, A. E. T.	"Yarra View," Lilydale	71
Foletta, G. G., and Son	Buxton	120	Payne, T. E. N.	"Woodburn," Kilmore	76
Geelong Grammar School	Corio	78	Poole, M. A., and D.	Caldermeade	125
Gleeson, P. J., and Son	Tynong	261	Poole, M. A., and D.	Yannathan	104
Gorman, A. W.	"Cathcart," Alexandra	57	Potter, W. J.	Longwarry North	130
Griffin, G. W.	Gladysdale	50	Powell, T. S.	"Carellen," Mansfield	43
Griffiths, J. G.	Benalla	151	Reid, Mrs. B., Estate of	Bundoora	74
Gross, Mrs. G. F.	Green Lake	21	Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Hamilton, A.	Flinders	67			
Henry, J. A.	Warrnambool	45	Roe, Thomas H. P.	Cobram	27
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	70	School of Horticulture	Burnley	0
			State Experiment Farm	Rutherglen	47
Jakobi, L. W.	"Granada," Yannathan	89	State Research Farm	Werribee	245
Johnson, F. G.	Horsham	21	Stephens, Dr. F.	Vermont	40
Judd, Mrs D. R.	Broughton	16	St. Joseph's Home	Sebastopol	53
Lawrence, P. H.	"Rainga," Tarrawarra	83	Vagg, T. R.	Officedale	40
Light, D. T.	Noradjuha	8	Vagg, E. J.	Leongatha	48
Longerenong Agricultural College	Dooen	39	Warnock, J. A.	Benalla	76
			Waterhouse and Son	Pakenham	55
Maloney, P. J.	Tongala	66	Wells, W. G.	Caldermeade	67

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.	District.	Herds.	Cattle.
Ballarat	119	2,757	Rutherglen	19	279
Benalla	97	540	Traralgon	3	174
Bendigo	63	1,564	Wangaratta	45	438
Broadmeadows	68	3,030	Warrnambool	7	124
Doncaster	19	485	Whittlesea	122	5,557
Geelong	138	4,589	Yallourn	4	370
Heidelberg	25	746	Yarragon	36	1,656
Horsham	7	382	Yea	50	147

There are also 319 herds in which 11,364 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

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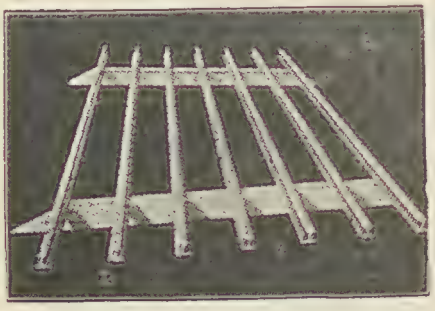

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STANDARD HERD TEST

REPORT FOR THE YEAR 1945-46

By W. J. YUILL, Supervisor of Herd Testing

Captain A. E. T. Payne's Reserve Champion Guernsey herd which averaged 533 lb. butterfat.

THE Government Official Herd Test or, as it is more commonly known, the Standard Herd Test, began in a very humble way in 1912, when only 62 cows were tested for five breeders. The scheme grew out of a conference between the agricultural authorities of the day, and a small group of enthusiastic breeders of pure stock. These owners had faith in the dairy ability of their registered cattle, and desired an opportunity to place before breeders and farmers verification of their opinion, which could be gained only in some form of public test or trial.

From this humble beginning the Standard Herd Test has grown to be an institution of great importance in the breeding plans of many breeders and farmers in Victoria and other parts of Australia.

Until 1933, when 2,861 cows were tested, the history of the Test was one of continued success and expansion. Its development was favorably influenced by the extensive advertisement resulting from the 39 tours of the Better Farming Train, which began to operate in 1925. The general effect of these tours was even more apparent in the

development of the Association Herd Test, where the tested cow numbers rose to 104,000 in 1933, including upwards of 3,000 registered animals.

Both systems however, suffered a serious setback during the years of depression in the industry, when butterfat prices fell below a shilling a pound. The Standard Herd Test continued to decline until 1938, when only 1,470 cows were tested.

With the closing down of a large number of Herd Testing Associations, quite a number of dairy-farmers and breeders lost their herd-testing service. Extensive enquiries were then made by many dairy-farmers with a view to re-entry to the Standard Test, but unfortunately this could not be acceded to, for the transfer of a considerable number of dairy officers to war work made it impossible to provide the necessary service. However, since the cessation of hostilities, and the return of some officers to their pre-war work, every effort has been made to absorb all breeders who had made application to have their herds tested by the official system.

During the year under review, 2,752 cows completed their test for the average yield of 330 lb. butterfat. This figure is only 4 lb. below that of the previous year, and would have been higher but for the number of cows carried over from the drought conditions of 1945, and also because of cows that had been a long time calved in some new herds before the first test was recorded.

Dr. A. R. Haywood's Junior four-year-old Jersey, "Windrest Island Star 2nd", produced 646 lb. butterfat.

Leader of the Junior four-year-old section, "Maxon Starbright's Pansy", owned by Messrs. G. A. McNabb and Son. This young Jersey produced 735 lb. butterfat.

Never previously has the number of recorded cows been as great as at present. Actually the number of cows at present being tested is more than 60 per cent. greater than the total listed in the 1945 Annual Report. The resurgence in test work is also noticeable in the Association Test, where upwards of 90,000 cows are now being recorded, compared with 23,000 in 1945.

Many non-testing breeders and farmers in this country find it hard to believe that many overseas farmers are in the habit of demanding production records for several generations on both sides of a pedigree when purchasing a herd sire. These sceptics are inclined to think that too much emphasis is placed on yields when it comes to choosing breeding stock. However, during the past 20 years, both in this State and New Zealand, farmers and breeders have developed a similar tendency, resulting in the introduction of a Sire Survey Service, the basis of which is the comparison of the yields of the mates and daughters of a sire.

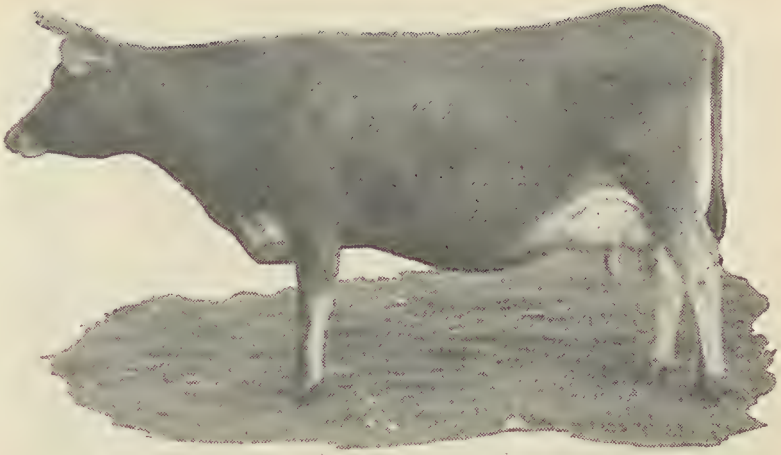
Non-testing breeders are being forced to provide evidence of the productive ability of their stock, in order to make satisfactory sales of their surplus animals, particularly young bulls.

The desire to participate in the sales made through the medium of the Government Bull Scheme, has no doubt drawn some breeders into the Standard Herd Test, and also

the desire for the wider publicity arising from the Standard Herd Test Report.

THE CHAMPION HERD

Mr. R. M. Chirnside, who recently sold his interest in the famous "Mornmoot" Herd, can claim the honour of having gained the title of champion herd in the Standard Test on nine separate occasions. No other breeder in Australia has even approached this remarkable achievement.



The leading Senior four-year-old, "Milview Aim's Coronation" from Mr. H. Jackson's "Lockington" Jersey Stud. This cow yielded 611 lb. butterfat

Testing breeders will generally agree that the continued excellent performances of the "Mornmoot" Jerseys adequately express Mr. Chirnside's special knowledge of mating the lines of breeding in this famous herd, and also that there has been excellent managing ability and control of the cows, while they have been under test.

The 542 lb. average butterfat yield (with allowances for junior cows) of the 30 cows is not the highest yield made by this herd, but there are more cows in this year's herd than in any previous year it has won the Championship. The 376·1 lb. butterfat average of the 12 junior two-year-olds, and the 523·2 lb. average of the 5 junior three-year-olds, have materially helped the herd to win the coveted position, as well as to provide much confidence for its future.

RESERVE CHAMPION HERD

The Champion Herd of 1943, owned by Captain A. E. T. Payne of Lilydale, gained the Reserve position this year. The herd's 491 lb. butterfat average, is increased to 533 lb., when all allowances are added. A remarkable feature of this Guernsey herd is the high average yield of 613·7 lb. butterfat of the twelve mature members of the herd.

The "Yarraview" herd has held a prominent position in the Standard Herd Test for many years, and a comparison of the Champion and the Reserve Champion herds over a period of years will show how consistently high their average production has been.

Year.	"Mornmoot" Jerseys.				"Yarraview" Guernseys.			
	Cows.	Butterfat.	Butterfat with Allowances.	Position in Standard Herd Test.	Cows.	Butterfat.	Butterfat with Allowances.	Position in Standard Herd Test.
		lb.	lb.			lb.	lb.	
1945–46 ..	30	473	542	Champion	24	491	533	Reserve
1944–45 ..	38	443	536	3rd	25	454	536	4th
1943–44 ..	27	432	522	Champion	23	447	502	3rd
1942–43 ..	24	474	545	3rd	18	506	556	Champion
1941–42 ..	23	461	552	5th	20	511	561	4th
1940–41 ..	21	495	562	Champion	27	462	525	3rd
1939–40 ..	20	481	553	Champion	33	452	527	3rd
1938–39 ..	27	455	539	Champion	20	451	515	Reserve
1937–38 ..	24	496	570	Champion	17	421	472	8th
1936–37 ..	17	598	650	Champion	25	380	445	9th
1935–36 ..	15	522	614	Champion	} Herd newly entered in Test			
1934–35 ..	13	524	599	Champion				

"Windrest Twinkle's Charm", Mature Jersey owned by Dr. A. R. Haywood, yielded 625 lb. butterfat.

OTHER HERDS

With a difference of less than 3 lb. butterfat in their herd averages, last year's Champion and Reserve Champion herds now occupy third and fourth position respectively.

Mr. P. J. Maloney's 27 "Belgonia" Jerseys are an even lot of performers, as are Mr. H. Jackson's 18 Jerseys from his "Lockington" Stud. The evenness of these herds is best seen in the fact that only 3 or 4 lb. difference exists between them, whether actual butterfat or butterfat with age allowances are compared. Mr. Jackson is ahead on butterfat, while Mr. Maloney's herd is less than 3 lb. ahead when allowances are added.

The "Belgonia" herd's 446 lb. butterfat average, is increased to 522·3 lb. under these conditions, while the "Lockington" herd's 450 lb. actual butterfat average, becomes 519·5 lb. when provision has been made for the junior cow allowances.

"Belgonia Eileen 19th" the 489 lb. butterfat leader in the senior-two class, and "Junette 21" second in the "baby" class with a 474 lb. yield, indicate the quality of Mr. Maloney's young cows, while "Junette 12" with 611 lb. butterfat, represents the herd on the "over 600 lb." list.

Mr. Jackson's herd has three representatives in the "over 600 lb." list: "Surrey Bonnie 15th" last year's leading junior-four, with 649 lb. butterfat, has a similar mature yield in this report, while two remarkably efficient junior cows "Milvue Aim's Coronation" last year leader among the "senior threes," with 645 lb. butterfat, has shown her quality by topping the senior-four class on this occasion with 611 lb. butterfat.

"Surrey Bonnie Madeira 12th," second in the senior-two class in 1945, leads this year's splendid bunch of senior-three-year-olds, with 602 lb. butterfat yield.

The excellent performances of the junior cows in the "Belgonia" and "Lockington" herds, indicate that formidable opposition will be encountered by any who in the near future may be seeking a place among the leading six herds of the Standard Test.

In fifth place is Dr. A. R. Haywood's "Windrest" Jersey Stud. An interesting feature of this 31-cow herd, which averaged 474 lb. butterfat (517 lb. when all allowances were added) is the 514 lb. butterfat average of the 17 mature cows—mainly daughters of "Gadget" (Imp.), whose influence in the "Windrest" herd has been most marked. The fact that the herd average with allowances is similar to the actual butterfat of the mature cow group, indicates that the younger cows by "Rosebay's Noble" should maintain the herd at the present high level.

"Windrest Island Star 2nd," last year's 634 lb. butterfat leader in the senior-three section, appears in this year's "over 600 lb." list, together with her mature team mates "Twinkle's Charm" and "Chevey's Beauty."

The 66 Red Polls at the Werribee Research Farm, and the 69 "Willow Park" Shorthorns have approximate average yields of 300 lb. butterfat, and 383 lb. with allowances.

The 47 "Maxon" Jerseys of Messrs. G. A. McNabb and Son averaged 355 lb. butterfat. Two entries from this herd appear on the "over 600" list, while 23 mature cows averaged 395 lb. butterfat.

Mr R. Maher's 50 "Rosemont" Jerseys included 24 mature cows, with a 393 lb.

average yield; while 18 junior two-year-olds with a 328 lb. average bring Mr. J. W. Bennett's 47 cow average up to 451 lb. butterfat, with allowances for junior cows.

Among the herds of less than 15 cows, Messrs. O. Ronalds and Son, last year's leader, has 12 cows that head the list with 526 lb., and 479 lb. actual butterfat.

Messrs. S. H. Masters and Son, follow closely with 14 cows on 464 lb. butterfat, the evenness of production throughout the herd being a marked feature of the year's work. The unusually good even lot of junior cows of Messrs. Masters' herd bring the "allowances" figures up to 514 lb. butterfat.

Three Standard Herd Test Champions. Left to right: "Yarraview Ruby", this year's Champion Cow; "Yarraview Siren", Reserve Champion, with 807 lb. butterfat and "Yarraview Le Mode", the 1944 Champion; yielded 787·5 lb. butterfat.

Mr. R. Cox of Swan Hill, and Messrs. A. E. Lind and Sons, of Mt. Taylor, also have good average junior-cow yields, which suggest that better results are likely in future.

Among newcomers to the Standard Test are several herds with excellent yields. Mr. A. Wilson of Tongala, has a 418 lb. butterfat yield, which includes 12 mature cows averaging 431 lb. butterfat. Mr. J. A. Till's 21 cows with a 405 lb. average, include a promising lot of 10 junior-two's that averaged 357 lb. butterfat, a figure higher than most of the leading herds of the year. Messrs. Gardener Bros. have a 409 lb. average for their 22 cows, nine of which are mature, their average yield being 448 lb. Mr. A. E. McKenzie of Kerang, has 12 entries that finished on 404 lb. butterfat. This figure resulted from an even lot of animals in the various age classes.

"Yarraview Ruby", Champion Herd Test Cow of the year. This mature Guernsey is owned by Captain A. E. T. Payne, of Lilydale, and yielded 835·5 lb. butterfat.

The continued applications from breeders to enter their herds in the Standard Herd Test, many having been testing their cows in the Association Test over a period of years, and also once prominent Standard Test breeders who have been out of the test during the war period, may conceivably displace some of the breeders who have been fairly prominent during the period when the volume of pure-bred herd testing work has been low.

THE CHAMPION AND RESERVE CHAMPION COWS

Never before in the long history of the Standard Herd Test have the Champion and Reserve Champion positions been held by two over 800 lb. butterfat cows from the same herd. This proud distinction has been achieved by Captain A. E. T. Payne—indeed, the three highest producers of the year are all "Yarraview" Guernseys. All three are Standard Herd Test Champions, and each has exceeded the 800 lb. butterfat level.

"Yarraview Ruby" after a lengthy spell, heads the year with a yield of 835·5 lb. butterfat, while "Yarraview Siren" (last year's champion), moves on to 806·9 lb., being followed by the 1944 champion "Yarraview Le Mode". Just how remarkable a cow "Le Mode" is may be seen in her 787·5 lb. yield, after a serious set-back through a horned udder early in the season. Her 976 and 963 lb. records in the two previous years, place this cow among the top dairy cows of Australia irrespective of breed. Not only does the "Yarraview" Stud fill all three top places, but it also fills five of the six mature cow positions, the fourth place going to Mr. G. L. S. Cowan's Friesian cow, "Upper Lappan Duchess" with the great milk weight of 19,263 lb., and 783 lb. butterfat.

Although the Jerseys were excluded from the senior-cow class, there is no doubt about the breed's claims to popularity and efficiency, for every position in the remaining six classes is filled by its representatives.

The leading Junior two-year-old "Bamawm Lassie Belle 2nd", owned by Mr. L. Williams, produced 478·5 lb. butterfat.

Although Mr. R. M. Chirnside relied mainly on the splendid average performance of his herd to win the championship, there were three mature cows in the "over 600 lb." list, namely "Mornmoot Princess Madeira 9th" (6 years 610 lb. butterfat average), "Mornmoot Northwood Madeira 14th" (637 lb.) and "Mornmoot Princess Madeira 21st" (611 lb. butterfat), a full sister "Madeira 9th," their dam being the thrice over 700 lb. cow "Mornmoot Princess Madeira 3rd," whose dam in turn is old "Mornmoot Princess Madeira," with a 10-year life-time average of 595 lb. butterfat. This remarkable strain is breeding on well.

"Mornmoot Fancy Starbright 13th," leads the "junior three" class, with a fine yield of 592 lb., while her team-mate "Mornmoot Fame" is third with 577 lb. butterfat. The 583 lb. yield of "Mornmoot Ovation," brings this cow into the junior four-year-old list, while "Fancy Starbright 17th" appears among the junior-two's with 448 lb. butterfat.

Mr. L. Williams' "Bamawm" Stud of Jerseys, has several representatives listed. "Bamawm Princess Noelle 2nd," a 627 lb. junior four-year-old, and "Bamawm Daisy Bell," a 606 lb. butterfat mature cow, appear among the "over 600 lb." cows of the year. "Bamawm Bonnie Madeira," second in the junior-three class, with 587 lb. butterfat, and "Bamawm Lassie Bell 2nd," the leading junior-two with 478·5 lb., are descendants of two famous herd test cows.

[*continued on page 429.*

Two "over 600 lb." cows from Mr. R. M. Chirnside's "Mornmoot" Jersey Stud. Left.—"Mornmoot Northwood Madeira 14th" (636.7 lb. butterfat). Right.—"Mornmoot Princess Madeira 9th" (637 lb. butterfat).

IRRIGATED SUMMER CROPS

Pyramid Hill District Competition — 1946

Report of the judges, J. A. AIRD, B.Sc., B.Agr.,Sc., Chief Irrigation Officer, State Rivers and Water Supply Commission, and R. H. BEATTIE, B.Agr.Sc., Field Agrostologist

DURING the past twenty years, annual summer fodder crops have declined in popularity in the irrigation districts; that is to say, while the area sown to pasture has trebled, the area of annual fodders has remained practically constant. For many years, farmers in the irrigation districts along the Loddon River, on the Tragowel Plains, and at Dingee, Kerang, and Koondrook, have been the main growers of fodders of this type. It is fitting, therefore, that the largest and most popular competition for summer fodder crops should be that of the Pyramid Hill District Agricultural Society, whose members are water users in the Tragowel Plains Irrigation District.

In this year's competition, there were ten entries of which eight were of Japanese millet, one of ambercane, and one of saccaline. In other years, about one-third of the entries have been Sudan grass, and its absence from the competition this year may have been due to the possibility of a water shortage at the time it would normally have been sown and shortage of seed, rather than to its having suddenly become an unpopular crop in the district.

Summer crops as we know them produce a large amount of nutritious fodder and, in the Pyramid Hill district it is general practice to grow them to provide green feed in the summer period when pastures are dry, and later on during the autumn as a supplement to the limited amount of available pasturage. Judging therefore is done in February before the crops are grazed or cut.

The Popular Summer Fodders

Under conditions in the Victorian irrigation districts a "summer crop" includes:—Maize, Japanese millet and the fodder sorghums. The sorghums would be represented by Sudan grass, ambercane, saccaline and imphee.

Maize, although strictly speaking in the same class, grows best in a more humid climate and under northern conditions cannot compete with the sorghums. It, therefore, will not be discussed.

Disregarding the peculiarities of each species, the summer fodders can be classified in a practical way into two sections. On similarities of habit of growth and methods of utilization, Sudan grass and Japanese millet are in the first class and the bulky sorghums—ambercane, saccaline, imphee in the other. Japanese millet and Sudan grass are relatively easy crops to graze off. They also make good quality hay by appropriate methods. If allowed to mature for seed production, the harvesting is a practical consideration. With the coarser fodders, grazing is inefficient and haymaking rather a doubtful procedure, although there are other methods of conserving the great bulk of feed that they will produce, such as ensilage, for example.

It is generally realized that there is a danger of stock poisoning when sorghums are grazed. This danger is slight with Sudan grass, and even though the risk is greater in other sorghums, if care is taken in grazing the danger is remote.

Young sorghum, especially when checked in growth is dangerous, and should not be grazed in such condition. The danger lessens as the plant matures, and disappears when the seeds are formed. Conserved as hay or silage, the fodder is quite safe. Japanese millet is particularly useful for providing early grazing. It can be grazed when about 6 in. high, and should not be allowed to grow over 1 ft. high while being utilized for grazing. Its water requirements are higher than the sorghums, which fact is to its disadvantage in irrigation districts where water is available at irregular intervals. The optimum water requirements of these

Stripping Japanese millet seed with a header harvester

crops is not known, but it is generally accepted that Japanese millet requires watering at frequent intervals during the hottest parts of the summer in northern areas.

The bulky sorghums, ambercane and saccaline, are not suited to grazing. They are best utilized by a system of cutting, chopping up, and feeding out, or conserved as silage. These particular crops are admirably suited to silage making, but attempts to conserve them in this manner appear to be rare.

Conservation of Sorghums

In a good autumn, it seems likely that a proportion of these summer fodder crops may be wasted, unless conserved for future use. The period of the year is against good hay making even for crops suitable to that purpose, and some of these crops are not. Under such circumstances, the answer seems to be to make silage. Ensilage of fodders is a straightforward process. In Australia, it has been regarded as a mysterious undertaking, calling for more than the usual care and skill, and therefore has not been accepted as a regular farm operation. Errors of judgment are much more apparent in silage than in haymaking, although the skill and attention to detail necessary to make good hay is comparable to that required to make good silage.

Silage is fodder conserved in a succulent state by a controlled fermentation, while hay is fodder conserved in a partially dried out state to prevent any fermentation taking place. Briefly, the aim in making silage, is to encourage lactic fermentation and suppress butyric fermentation which makes the product unpalatable and sometimes putrid.

The butyric group of organisms thrive under conditions where there is an absence of oxygen with low acidity. The aim, therefore, should be to provide conditions that bring about active lactic fermentation early, and then by the time air is excluded by pressure, the acidity is too high for butyric fermentations to take place.

When fodder is cut in too dry a condition the material is light, and it is very difficult to get sufficient pressure to bear to prevent too high a temperature developing. When excessive heat is developed, charring occurs, and as well as producing unpalatable silage there are considerable losses in nutrients.

On the other hand, with highly succulent fodder, if filling be done too rapidly, air is excluded from the commencement, and conditions are favorable for the butyric acid-formers, resulting in a very unpalatable silage. Fodder should be cut in a succulent stage, and slow filling of such material should be practised for the best results. The fermentations take place automatically and good results can be achieved without any refinements.

However, there are two other methods which have been adopted to aid the natural processes in the desired direction, and by recourse to them, it has been possible to conserve effectively as silage, protein-rich materials with very little loss of nutrient. They are called the A.I.V. method and the molasses method, and both are aimed at the production of acidity early enough to prevent butyric fermentations.

The A.I.V. method (due to Professor Artturi I. Virtanen, of Finland) tackles the problem in a direct way by the addition of acid to the fodder immediately it is ensiled. The process is a controlled one, and the acidity is brought to between what is termed pH3 and pH4.

The molasses method involves the addition of molasses as a cheap form of readily fermentable carbohydrate at the time of ensiling. In practice, about 40 lb. of molasses per ton of green fodder is diluted in water, and sprayed evenly on the material as it is being ensiled. There are no precautions necessary with this method, which is quite effective.

Harvesting millet in the Kerang district

Silage can be made in overhead silos, in pits and trenches underground, or in stacks above the ground.

In irrigation districts, where silage-making is unlikely to become a standard practice, pitting or stacking might be the most practicable. Stacks suggest that the material is to be used in a reasonable time. There is more waste with stacks than with other methods, and other difficulties are often associated with uneven settling. However, apart from building difficulties, stacking is both cheap and effective.

For the purpose of reserving against drought, the pit or trench has much to recommend it, although feeding from the pit is difficult. Whichever method is finally adopted, the site must be well-drained.

The Competition Awards

The winning entry was submitted by Mrs. H. McKinnon, showing a good even crop of Japanese millet. This was sown in early November, and was germinated by the moisture in the soil from October rains. It was subsequently watered four times.

The land which had not previously been cultivated had been fallowed and 15 lb. of superphosphate had been used per acre. Although the "bays" were longer than the standard maximum of 10 chains, the grade was somewhat greater than usual in the district, enabling the water to cover the ground more rapidly. The crop showed the benefit of sound preparation in the uniform heavy crop and freedom from weeds.

Second prize was obtained by Mr. C. Twigg's crop of 10 acres Japanese millet, sown at the end of October with 14 lb. seed and 100 lb. super., watered up. The crop was in forward condition, and the intention was to utilize most of it for seed production. Mr. Twigg is mainly engaged in dairying, with some cropping.

The 22-acre crop of ambercane exhibited by Mrs. A. Gronow, of Mincha, was placed third. The crop was sown with 10 lb. seed and 60 lb. super. per acre in October after rain, and then watered up. The area was "new country" having just been cleared of lignum growth and there were a number of bare patches due to uneven grading. In places, the crop was over 10 ft. high.

List of Awards

Name.	Layout.	Uniformity.	Weeds.	Yield.	Total.
Maximum points..	20	20	20	40	100
McKinnon, Mrs. H.	14	18	19	36	87
Twigg, C., Pyramid	12	19	19	32	82
Gronow, Mrs. A., Mincha ..	12	11	20	36	79
Shipp, W., Pyramid (1)	13	18	18	30	79
Spowart, S., Mincha (2) ..	14	14	12	32	72
Spowart, S., Mincha (1) ..	16	12	20	24	72
Erwin, E. P., Pyramid ..	10	12	17	28	67
Cassidy, A., Pyramid	12	12	19	24	67
Shipp, W. (2) ..	11	13	14	24	62
Edwards, T., Pyramid	11	12	19	20	62

POULTRY FEEDING TESTS

1945-46

By W. O. PEDERICK, formerly Assistant Poultry Expert,
and A. G. CLARK, Poultry Foreman

EXTENDING over a period of twelve months from 1st April, 1945, to 31st March, 1946, poultry feeding tests were conducted at the State Research Farm, Werribee, to test further aspects of whole grain feeding.

For the purpose, 250 Australorps and 250 White Leghorn pullets, hatched in August and September, 1944, were used and divided into pens each containing 50 birds. The birds were intensively housed in a laying shed 110 ft. long and 20 ft. deep, divided into ten pens each 11 ft. by 20 ft., providing a little over four square feet of floor space per bird.

The following rations were fed :—

Pens No. 1 (Australorp) and 10 (White Leghorn)—No mash ; whole wheat and meatmeal always available in separate hoppers ; no green feed.

Pens No. 2 (Australorp) and 9 (White Leghorn)—No mash ; whole wheat and meatmeal always available in separate hoppers ; green feed.

Pens No. 3 (Australorp) and 8 (White Leghorn)—Control pen ; Dry mash (30 lb. bran, 60 lb. pollard, 10 lb. meatmeal) always available in hoppers ; mixed grain (4 parts wheat, 1 part oats, 1 part barley) fed in litter ; green feed.

Pens No. 4 (Australorp) and 7 (White Leghorn)—No mash ; whole wheat always available in hoppers ; no meatmeal ; green feed.

Pens No. 5 (Australorp) and 6 (White Leghorn)—No mash ; whole wheat always available in hoppers ; 1 lb. of meatmeal fed each day in trough ; green feed.

Shell grit was always available in all the pens.

As in previous tests, the cost of food was arrived at by taking the average wholesale prices published in the daily press during the year. Delivery charges were not added. The eggs laid were valued at the gross wholesale hen-egg price without deducting any marketing or grading charges. These charges would probably average approximately fourpence per dozen, which with an average production of 14 dozen eggs would amount to 4s. 8d. per bird per year.

These tests were conducted under very adverse conditions. Owing to the war and the drought, no meatmeal was available from the middle of November to the end of January; no bran and pollard during the months of October and January, and practically no green feed during the last six months. These factors upset the balance of the tests especially as far as meatmeal and green feed were concerned. A further upset to the birds, particularly the White Leghorns, was caused by the erection of new buildings in front of the feed test shed. Although, no doubt, the production generally was affected by the conditions, some interesting lessons can be learned.

Conclusions:

These tests have again shown that satisfactory production can be obtained from a plain ration consisting of whole wheat, meatmeal and green feed, in fact with both breeds, this ration gave the highest egg production.

It will be noted that the pens which had grain and meatmeal always available consumed a large amount of meatmeal—approximately 15 per cent. of the total ration—but this amount is evidently necessary with whole grain feeding because in Pens Nos. 5 and 6 where the meatmeal was limited, and Pens Nos. 4 and 7 where no meatmeal was given, the production was much lower.

The figures in the table on page 404 show the importance of animal protein in poultry feeding. The four pens of Australorps receiving meatmeal averaged 181 eggs per bird, while the "no meatmeal" pen averaged only 143 eggs per bird.

The four pens of White Leghorns receiving meatmeal averaged 164 eggs per bird, while the "no meatmeal" pen averaged only 117 eggs.

Furthermore, in the two pens (Nos. 2 and 9) which had meatmeal always available, 6·1 oz. of food was consumed for each egg laid, whereas in the two pens (Nos. 4 and 7) which had no meatmeal, 8·4 oz. was consumed for each egg laid, which shows that more economical egg production can be obtained when meatmeal is available to the birds than when it is withheld.

The importance of green feed as a factor in maintaining good health was again proved. Among the Australorps the mortality rate in the pens receiving green feed was 5·5 per cent. and in the "no green feed" pen 34 per cent. Among the White Leghorns, the mortality rate in the pens receiving green feed was 8·5 per cent. and in the "no green feed" pen 36 per cent. The egg production in the "no green feed" pens appears to be reasonably good, but the production figures are increased by the fact that when a bird dies she is immediately replaced with a fresh bird. This practice has always been adopted in the feeding tests. It has been found that keeping to the original number of 50 birds in each pen facilitates the feeding and working out of averages, &c.

The Table shows particulars of the food consumed, cost of food, eggs laid and their value, and the return over food cost.

Test No. 26.—Werribee Feed Tests, 1st April, 1945, to 31st March, 1946 (12 Months).

Pen No.	Fifty Birds per Pen.	System of Feeding.	Number of Birds Died.	Bran.	Pollard.	Meat-meal.	Wheat.	Oats.	Barley.	Total Food Consumed.	Cost of Food.	Eggs Laid.	Value of Eggs.	Return over Food Cost.
				lb.	lb.	lb.	lb.	lb.	lb.	lb.	£ s. d.		£ s. d.	£ s. d.
1	Australorps ..	Wheat and meatmeal always available in separate hoppers; no green feed	17	..	..	570	3,110	..	..	3,680	13 6 1	8,820	65 14 1	52 8 0
		Average	..	..	..	..	..	..	..	**73.6**	**0 5 4**	**176·4**	**1 6 3**	**1 0 11**
2	Australorps ..	Wheat and meatmeal always available in separate hoppers; green feed	3	..	..	545	3,130	..	..	3,675	13 4 5	10,060	75 1 1	61 16 8
		Average	..	..	..	..	..	..	..	**73·5**	**0 5 3**	**201·2**	**1 10 0**	**1 4 9**
3	Australorps ..	Control pen—dry mash in hopper; mixed grain in litter; green feed	3	807	1,615	196	1,582	395	395	4,990	16 14 0	8,843	65 19 11	49 5 11
		Average	..	..	..	..	..	..	..	**99·8**	**0 6 8**	**176·9**	**1 6 5**	**0 19 9**
4	Australorps ..	Wheat always available in hopper; no meatmeal; green feed	2	..	..	..	3,470	..	..	3,470	11 1 8	7,152	53 12 9	42 11 1
		Average	..	..	..	..	..	..	..	**69·4**	**0 4 5**	**143·0**	**1 1 5**	**0 17 0**
5	Australorps ..	Wheat always available in hopper; 1 lb. of meatmeal fed daily; green feed	3	..	..	283	3,650	..	..	3,933	13 6 8	8,480	63 12 2	50 5 6
		Average	..	..	..	..	..	..	..	**78·9**	**0 5 4**	**169·6**	**1 5 5**	**1 0 1**
6	White Leghorns	Wheat always available in hopper; 1 lb. of meatmeal fed daily; green feed	5	..	..	283	3,470	..	..	3,753	12 15 2	7,600	56 6 1	43 10 11
		Average	..	..	..	..	..	..	..	**75·1**	**0 5 1**	**152·0**	**1 2 6**	**0 17 5**
7	White Leghorns	Wheat always available in hopper; no meatmeal; green feed	5	..	..	..	3,325	..	..	3,325	10 12 5	5,865	44 0 10	33 8 5
		Average	..	..	..	..	..	..	..	**66·5**	**0 4 3**	**117·3**	**0 17 7**	**0 13 4**
8	White Leghorns	Control pen—dry mash in hopper; mixed grain in litter; green feed	4	804	1,611	195	1,582	395	395	4,982	16 13 6	8,323	61 17 3	45 3 9
		Average	..	..	..	..	..	..	..	**99·6**	**0 6 8**	**166·5**	**1 4 9**	**0 18 1**
9	White Leghorns	Wheat and meatmeal always available in separate hoppers; green feed	3	..	..	540	3,170	..	..	3,710	13 6 5	9,189	68 7 0	55 0 7
		Average	..	..	..	..	..	..	..	**74·2**	**0 5 4**	**183·8**	**1 7 4**	**1 2 0**
10	White Leghorns	Wheat and meatmeal always available in separate hoppers; no green feed	18	..	..	580	3,000	..	..	3,580	13 0 3	7,639	56 11 9	43 11 6
		Average	..	..	..	..	..	..	..	**71·6**	**0 5 2**	**152·8**	**1 2 8**	**0 17 6**
		Total for 500 birds ..	..	..	..	..	..	..	..	39,098	134 0 7	81,971	611 2 11	477 2 4
		Average	..	..	..	..	..	..	..	**78·2**	**0 5 4**	**163·9**	**1 4 5**	**0 19 1**

Notes.—Average gross price of eggs per doz., 1s. 9¼d.; food cost per dozen eggs, 4¼d.; food consumed per egg laid, 7·6 oz.; food consumed per bird per day, 3·4 oz.; cost of food per bird per week, 1¼d.

LIVE STOCK NOTES

By
A. C. T. HEWITT, M.Agr.Sc.,
Live Stock Science Officer

THE COMING HARVEST

PREPARATIONS for the coming harvest should be commenced early so that, when the crops are ready, no time is lost in cutting, curing and storing them. Surplus pasture paddocks should be closed up as soon as the growth on the other paddocks is sufficient to carry the stock; all litter, including wire, sticks and stones, should be gathered up, and low obstacles which may be covered by the spring growth of the grass should be marked as a precaution against damage to mowers and other machinery. Spare parts are still difficult to obtain, and delays at harvest time may result in poor quality hay being produced. All harvesting machinery should be put in good working order now.

Good quality pasture and lucerne hay cannot be made if it is not handled quickly. It must be cured and stored as soon as possible after it has been cut and the cutting must be done as soon as the grass is ready, otherwise it becomes fibrous and unpalatable. Pasture should be cut when the anthers of the grasses begin to show; lucerne should be cut when it is one-tenth in flower—and then speed is the essence of the contract, so that the material will not be leeched by rain or bleached by the sun.

Although poor hay is better than no hay, the relish with which stock will eat good quality material without waste should be sufficient incentive to make the best quality hay possible.

PURE-BRED BULL DISTRIBUTION PLAN

During 1945–46 an increased number of bull calves was sold through the pure-bred bull calf distribution plan, resulting from the increased demand from discharged servicemen on dairy farms. In addition to discharged servicemen, dairyfarmers who are unable to finance the purchase of a pure-bred bull are eligible to obtain a bull through the plan. Last year 100 bulls, comprising 80 Jerseys, 10 Dairy Shorthorns, 5 Friesians, 2 Ayrshires, 2 Australian Illawarra Shorthorns, and 1 Red Poll, were distributed through the plan. The prices paid for the bulls are based on the highest butterfat production record of the dam in 273 days under Standard Herd Test at 1s. per pound and the age of the bull. The bulls are sold to dairyfarmers whose applications are approved by the Chief Veterinary Inspector, at half of the purchase price. Approved applicants must abide by the conditions which are attached to the application forms. Except under special circumstances, an applicant will not be allotted a second bull. Since the plan was inaugurated in 1927, 2,156 pure-bred bulls have been distributed.

* * *

BACON AND PORK PIG COMPETITIONS

The bacon and pork pig competitions which will terminate in the exhibition of live pigs and the carcasses of their litter mates at

Bacon and Pork Pig Competitions are designed to encourage production of quality pigs like these

the Royal Show to be held in Melbourne this month will be different to other pig classes at the Show. Bacon and pork quality will be judged on the actual meat and in recognition of the fact that productive capacity is at least as important to farmers as carcass quality, awards will be based on the weight of the litter at eight weeks old, the rate of growth of two of the litter from birth until they are exhibited at the Show, and on the appraisal of the cut carcass of one of the two pigs comprising the show entry.

A very satisfactory number of entries has been received for these classes and there are some good litter-weight performances. The checking of birth dates, identification marks and weighing of litter at eight weeks old have been done by the Department of Agriculture.

Prize money of £80 is offered for these two classes and Government Certificates of Merit will be awarded to all entries which gain a specified standard of points in the awards.

One live pig of each entry will be exhibited throughout the show and carcasses of a number of the best entries will be exhibited in the refrigerated meat case in the Government pavilion at the Showgrounds.

(L. A. Downey, H.D.A., Pig Expert.)

* * *

MILK FEVER IN DAIRY COWS

Milk fever, often troublesome at this time of the year, makes its first appearance usually 12 to 72 hours after calving. Attacks may occur prior to calving however, and sometimes months afterwards. Affected cows are at first depressed and disinclined to move, with paralysis first affecting the hind limbs. Difficulty in standing is followed by the animal going down often lying with a lateral kink in the neck, or with the head sometimes turned to the flank. The eyes are dull and staring, pupils dilated and there is a complete loss of appetite. The muzzle is dry and the extremities cool to touch.

Treatment consists of the injection of calcium borogluconate in a 20 per cent. solution with pure sterile water under the skin by means of a needle and syringe. A 20 per cent. solution can be made by dissolving a 2½ oz. packet of borogluconate in 12 ounces of boiled water. It should be injected at blood heat—95° to 100° F. Such a dose would suffice for the average case. All needles and syringes should be boiled immediately prior to use, and the site of injection clipped and swabbed with iodine.

Some farmers use the udder inflation method of treatment which may give results when the borogluconate does not. (The reverse is also true.) When this method is used the teat should be swabbed with methylated spirits and teat siphons must be boiled. For preference the air should be pumped through some filter containing medicated gauze to lessen the risks of subsequent udder trouble.

Cows known to be prone to milk fever can be protected by an injection of calcium borogluconate immediately after calving.

(R. D. Irvine, B.V.Sc., Veterinary Stock Inspector.)

* * *

HERD-TESTING ACCOMMODATION

The accommodation problem on his herd-testing rounds has been solved by Mr. A. Marx, herd tester attached to the Maffra and Sale Herd Testing Association, who

uses the neat little caravan shown in the accompanying illustration as a bed-sitting room. The caravan is fitted with a comfortable bed, wardrobe, wireless, kerosene heater, easy chair, writing table, and several cupboards. Mr. Marx has his meals with the farmers. Many farmers are unable to join a Herd Testing Association because they are unable to provide sleeping accommodation for the tester. The more general use of a similar type of caravan would enable such farmers to enter their herds and obtain the full benefits of herd testing.

* * *

POULTRY NOTES

Soils can be roughly classified as clayey, loamy and sandy, the first type being least popular with poultry keepers on account of its tendency to hold surface water and its retentiveness of the droppings which accumulate more than they do on well-drained land. Heavy soils become stale sooner than lighter soils and this is a disadvantage, especially when chickens are reared on free range, unless the ground is properly worked each year or spelled each alternate year. Sandy soil usually has the disadvantage in being poorer and less likely to produce a good pasture; nevertheless, it is naturally so well drained that it will remain sweet for a long period if properly managed. Surface drainage in the poultry runs is essential, and many soils also need cultivating regularly so that rain and applied water will be freely absorbed.

If laying houses are situated in localities reasonably protected from north winds, it is best to face them to the north. The sun will then shine on the floors during most of the day and help keep the litter dry and the sheds warm. Under these conditions, land with a slope to the north or north-east should be satisfactory.

(H. F. Clinton, Poultry Expert.)

* * *

BEEKEEPING NOTES

A wide variation exists in the condition of colonies in the desert areas. Some apiaries are in splendid order, while others seem to be suffering from the effects of poor quality stores gathered in the late autumn, in the Grey Box areas.

If these backward colonies do not receive the right attention, it will be a considerable time before they reach honey-gathering strength, and one of the first things to do is to remove the poor quality stores, and if no building up flow of nectar is available, hand feeding will have to be resorted to.

Colonies suffering from effects of dwindle and poor quality stores will become weaker and weaker and may eventually die. When strong colonies are at hand they can be utilized to assist in building up these dwindled hives. In taking a check of the dwindled colonies, first see that the queens are satisfactory. It is lost labour, and uneconomical to assist colonies with run down queens. After checking over all weak colonies, and marking them, the following manipulations can be carried out:—

On a good flying day, preferably before noon, take from the strong colonies a couple of well-filled frames with bees adhering to them from the centre of the brood nest, but make sure that the queen is not on one of them. Shake the bees off the combs in front of the entrance to the weak hive. The house or nurse bees will crawl in and join the weak cluster, while the field bees will return to their own hive. Replace the brood combs in the strong colony.

When this operation has been repeated several times, the weak colony will be in a position to receive combs of well advanced brood.

It is a poor and wasteful policy to assist weak colonies with frames of brood and bees, before carrying out this operation of

The caravan used by Mr. A. Marx. on his herd-testing round.

getting the nurse bees into the weak colony. If brood and bees are merely placed in the weak colony, half of them fly back to the original colony and the brood will perish.

Changing locations with weak and moderate colonies is also an advantage, but care must be exercised as the change-over often results in the weak colony being killed out, if the change-over colony is too strong.

It is a good procedure to cage the queen of the weak colony if any doubt exists as to her safety.

If no strong colonies are at hand in the apiary, it is profitable to purchase or transport combless and queenless bees from a distance. These combless and queenless bees may be readily handled if a plentiful supply of water is sprayed through the screen, when caging and when portioning them out to the weak colonies. They can be dumped on to the bottom board and dipped out in pint and quart lots, according to requirements. Dump them in front of the entrance to the colony it is desired to strengthen. Bees under treatment from both the weak and strong colonies should be fed previously.

Colonies during the building up period should have a working surplus of at least twelve pounds of good honey, and the queen should have access to a fair area of good worker comb within the brood nest. If the migratory cover is used during the building-up period, stuff up the air holes to prevent a draught, or use a mat that reaches right across the hive.

(W. A. Collins, Apiary Inspector.)

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FOOD PARCELS FOR BRITAIN

IN 1927 the Department of Agriculture inaugurated a scheme whereby persons in Victoria could forward gift parcels of foodstuffs to friends and relatives in the United Kingdom. The purposes of the scheme were to establish and maintain goodwill and to extend our export trade by popularizing Victorian foodstuffs. Each year thousands of gifts of canned and dried fruits, jam, butter, wine and carcasses of lamb were distributed to all parts of Great Britain.

In a recent statement the Minister of Agriculture, Mr. W. G. McKenzie, said that never at any time was food more urgently required by our kinsfolk overseas, and he was pleased to say that arrangements had been made this year for the supply of 25,000 parcels each containing 7 lb. of food, consisting of cheese, dripping, tinned meat, marmalade, honey, canned and dried fruit. Parcels will be forwarded to any address in England, Wales, Scotland, and Northern Ireland. Orders cannot be accepted for Eire (Irish Free State) on account of the prohibitive customs duty.

Orders should be forwarded to the Director of Agriculture, Treasury Gardens, Melbourne, C.2, together with the names and addresses of recipients and a remittance at the rate of 14s. 6d. per parcel.

The British Authorities will not permit the receipt of parcels at frequent intervals, and accordingly only one order for each recipient will be accepted at the one time.

Mallee Research Station

EXPERIMENTAL WORK and RESULTS

By Officers of the Station.

THE Mallee Research Station was established in 1932 to serve as the centre for investigating problems affecting the north-western areas of the State. Its establishment was made possible by the decision of the Government of the day to allot for that purpose portion of the Wheat Marketing Fund, which was derived from the sale of Rumanian bonds accepted in payment for wheat delivered during the 1914–18 war. In addition to the establishment of an agricultural research station in the Mallee, money from the Wheat Marketing Fund has been used to erect and equip a cereal research laboratory at the State Research Farm, Werribee, and to purchase experimental milling equipment installed in the cereal section of the State Laboratories, Melbourne.

The original reservation consists of 1,928 acres of Crown land, 1½ miles from Walpeup. This area was then practically all virgin uncleared land, development of which proceeded steadily until by 1941, 941 acres were available for cropping. An area of 671 acres is reserved for windbreaks and shelter purposes, and 316 acres remain to be cleared. In 1946, the Research Station was enlarged by the purchase of 628 acres adjacent to its western boundary. All of this land has been cleared and will add to the usefulness of the station by providing an area of a more sandy type of soil than is present on the original Mallee Research Station reserve. For sheep experimental work, grazing is leased on an adjacent property.

The station is serving as a centre for research and investigation into wheatgrowing and allied problems in the Mallee. Subsidiary plots on farmers' properties are conducted at Woomelang (Mr. A. E. Barbary), Ultima (Mr. T. W. Atkin), Berriwillock (Mr. J. T. Drury), Manangatang (Mr. W. L. Turner), and Murrayville (Mr. E. S. Schultz).

Scope of Activities

The main work of the Research Station has been the testing of wheat and oat varieties and crossbreds, the production of new varieties, and investigations into cultivation, manurial, seeding, time of sowing, and disease problems in connection with cereal growing. Crop rotation has also been the subject of special research.

In view of the importance of sheep in Mallee agriculture, much attention has been devoted to investigations to determine the

most suitable type of ewe and sire for fat lamb production. Sheep management studies have included drought feeding and hand feeding during autumn.

In an effort to improve the standard of pastures, many types of pasture plants have been tested. Some of these are of local origin, but the majority are from other States and overseas sources.

Much attention has been paid to the problem of soil drift, but the continuity of this work was interrupted by the war.

An important phase of the station's work is the production and sale of pedigreed seed wheat, oats and ryecorn. In the past, demand for such seed has greatly exceeded the available supplies. The production of the new wheat variety, Insignia, constitutes an important achievement for the station and the Mallee.

Seasonal Conditions 1946

The average annual rainfall at Walpeup for the past 35 years is 1,256 points, but during recent years, rainfall has been much below this amount, causing serious adverse effects on the district generally. This year, the season has been much more favorable. Good rains were received in January, February, and March, enabling most fallows to be put into good order prior to sowing; but in some cases, control of mustard and paddy melons proved difficult. During April, May, and the early part of June, conditions were rather dry, but, because of the good subsoil moisture already present, the showers received were sufficient to ensure a satisfactory germination. Severe winds early in June did considerable damage to young and germinating crops, particularly on the more sandy areas. Further rains fell in the last week in June, and in August, seasonal conditions were very promising.

Owing to the drought in 1944–45, the sheep population throughout the Mallee is depleted, but both sheep and lambs are in good condition. The lambs on the Research Station have made rapid growth, and in August they were of comparatively greater weight than in any previous year.

The monthly rainfall for the present year, and for the past four years, together with the 35-year average is as follows:—

Month.	1946.	1945.	1944.	1943.	1942.	Average 35 Years.
January ..	122	1	20	61	36	67
February ..	257	19	18	15	89	100
March ..	187	1	39	10	5	71
April ..	22	..	47	99	80	73
May ..	66	55	156	31	182	121
June ..	121	295	16	73	206	131
July ..	123	106	97	63	218	116
August ..	..	156	16	132	232	128
September..	..	41	48	151	64	132
October ..	..	156	89	150	116	135
November..	..	64	53	82	116	88
December..	..	104	106	72	30	94
Totals ..	..	998	705	939	1,374	1,256
Period— April to October	..	809	469	699	1,098	836

Pure Seed Production

The production of pure seed for distribution to farmers is an important phase of the Research Station's activities. In 1946, the following varieties are being grown for seed:—

Wheat—Insignia, Pindar, Bencubbin, Rance 4H, Regalia.

Oats—Mulga, Dawn, Algeribee, Palestine x Dawn M5126 R4–1–1.

Rye—South Australian type.

RECOMMENDED CEREAL VARIETIES

Wheat

Insignia.—The production at the Mallee Research Station of the new wheat variety, Insignia, is its most important single achievement to date. It is expected that this variety will be widely sown in the Mallee during the next few years and contribute considerably to an increased yield per acre. This variety is the result of a cross between Ghurka and Rance 4H, and was named in 1946. It is an early wheat, maturing before either Ghurka or Rance. Insignia has a short strong straw, it is slightly taller than Ghurka, and stands better than most early types. Like Ghurka, it is resistant to flag smut, and is less susceptible to rust than Rance 4H.

It produces a semi-compact, brown-chaffed head with short awns, and has proved easy to thresh at harvest without showing any tendency for the grain to crack. Insignia

normally produces a medium-sized grain, with flour at least equivalent in baking quality to its Ranee parent and superior to Ghurka and Quadrat. The evidence obtained to date with respect to its yielding ability in the Mallee proves it to be an outstanding variety. Following preliminary tests made prior to 1940, this new variety has given consistent results in replicated trials at this station and at the associated farmers' plots during the past six years. In the detailed figures shown in Table 1 (page 414), it will be seen that Insignia leads all other varieties by 0·8 to 1·3 bushels per acre.

Typical heads of the new wheat variety, Insignia. The variety is the result of a cross between Ghurka and Ranee 4H.

Pindar was released from this station in 1941, and has proved popular with Mallee wheat-growers. In 1945, it was grown on 207,000 acres and ranked second in acreage in the Mallee to Ghurka. It is a selection from Ghurka, and is a distinct improvement on that variety in both prolificacy and flour quality. Furthermore, its grain is larger and more attractive. It is similar to Ghurka in disease resistance and field characteristics, except that it is slightly taller, and a little earlier in maturity.

Bencubbin is now well-known to Mallee farmers. It has given good yields at all Mallee centres; its taller straw is an advantage in dry years, enabling it to be cut for hay if so desired. It was bred in Western Australia, being the result of a cross between Gluyas Early and Nabawa. It now ranks third in popularity in the Mallee, being sown on 159,000 acres. Its chief drawback is its tendency to lodge in some seasons.

Ranee 4H has been regarded as the standard wheat for the central and northern Mallee for many years, and is still grown on approximately 40 per cent. of the area in the Millewa. It has a particularly attractive grain, and yields flour of better than average quality.

Regalia was released from the Mallee Research Station in 1938. It is an early-maturing wheat and resembles Ranee 4H in most characters, but has a bolder head with slightly more awn and a darker chaff. It shows to advantage in those years when good winter rains are followed by light spring rains.

Quadrat is now the most popular wheat in the Wimmera, but in Mallee tests has not proved equal to Insignia. It is a free-stripping, brown-chaffed variety with a strong straw, slightly taller than Ghurka, and normally produces a well-filled grain which does not crack readily. It is recommended for sowing in the southern Mallee.

Oats

Mulga has proved the best and most reliable of the early maturing oats. It has some disadvantages, but nevertheless it is thought that all Mallee farmers who grow hay should sow a proportion of early-maturing oats. Mulga provides a considerable amount of early grazing, but shows poor recovery after grazing.

Dawn.—Over a period of years Dawn has given the most consistent yields of any oat variety tested at Walpeup. It is of midseason maturity, produces hay of good quality, and has a large brown grain.

Algeribee, which is a selection from Algerian produced at the State Research Farm, Werribee in 1938, has proved better yielding than its parent, both for hay and grain, and its performance in the Mallee warrants its being sown in place of Algerian. Its habit of growth is very similar to Algerian,

but it produces a little more greenstuff at spring grazings, and it is slightly earlier than Algerian.

Palestine x *Dawn* M5126 *R*4–1–1 is a crossbred that has proved capable of producing a large amount of early green feed and then having the ability to recover after grazing and produce good grain yields. Like its Palestine parent, it gives high grain yields, but is usually too short in the straw to be regarded as a satisfactory hay variety—although the hay it produces is of good quality with a high proportion of grain.

Ryecorn

During the past few years, the value of ryecorn for stabilizing badly drifted areas has been demonstrated. Of the varieties available, one that has developed in South Australia by natural selection has proved most satisfactory. It is more upright and of quicker early growth than the variety, Black Winter, which has been used in southern and north-eastern Victoria. The area of ryecorn sown in the Mallee has increased from 96 acres sown in 1935–36 to approximately 7,000 acres in 1945–46.

SUMMARY OF EXPERIMENTAL WORK

During the war, the scope of the experimental work had to be reduced, and it has not yet been possible to re-establish all the work previously in progress. Experimental work has provided information on the following matters :—

A. *Experiments with Cereals*

(1) Variety trials, with wheat, oats and barley—for grain or hay—including the breeding and testing of crossbreds and selections, and recently named varieties from other States.

(2) Manurial trials with wheat and oats, and residual manurial trials with oats.

(3) Rate of seeding trials with wheat and oats, and time of sowing trials with wheat.

(4) Cultivation trials with wheat and oats.

(5) Oat grazing and recovery trials.

(6) Disease investigations, including the determination of resistance to flag smut of all crossbreds and varieties; selection for strain resistance of flag smut, testing the efficacy of pickling powders for the control of bunt, and testing the effect of these powders on germination and growth of the plant, and the use of modified hot water treatments in loose smut control of wheat.

Sheltered stable and yards at the Mallee Research Station.

(7) Various technical studies —crop growth studies, outside row effect in plots, &c.

(8) Permanent rotation trials embodying two, three, and four-course rotations, and other trials to determine the effect on soil fertility of cropping systems and soil preparation.

B. *Investigation into Fodder Crops and Pastures for the Mallee*

(1) Plant nursery — preliminary testing of new pasture species from various sources, and the selection of plants under local conditions.

An early crop of Mulga oats at the Mallee Research Station.

(2) Field tests—testing promising species under field conditions.

C. *Sand Drift Investigations*

(1) Control measures on cultivated land.

(2) Control measures on non-cultivated land.

(3) The stabilization of badly eroded areas in co-operation with farmers in various districts.

(4) Technical studies, measurements of amounts of erosion from cultivated land, studies of basic causes of erosion.

D. *Sheep Experiments*

(1) The mating of strong-woolled merino ewes with various breeds of rams to determine—

(*a*) the comparative suitability of the half-bred ewe progeny as mothers for fat lamb production ;

(*b*) the comparative suitability of the wether progeny as fat or carry-over lambs under Mallee conditions.

(2) The mating of crossbred ewes with different breeds of rams to compare the progeny as fat lambs.

(3) Investigations on the supplementary feeding of ewes.

(4) Investigations on the drought feeding of ewes and carry-over lambs.

Design of Cereal Experiments

In order that different soil conditions should not affect the comparison between plots, it has been found advisable to repeat or replicate each plot in a trial, rather than to use the older "single plot" method of testing. In the system adopted, which is known as the "Randomized Block System," plots are smaller than were used for single-plot testing, and each variety or treatment is sown once in a block of plots, and each block is repeated, usually four times. This system enables more accurate comparisons to be made between varieties or treatments, and the results to be examined statistically for significance. All cereal experimental results referred to in this report are those from replicated plots.

The Randomized Block System is designed primarily to test only one variable, i.e., different varieties, or different manurial treatments. However, much of the information required involves the consideration of more than one factor—e.g., does the rate of seeding or the time of sowing affect the manurial requirement of the plant?

Therefore, some trials have been sown on a design that enables such comparisons to be made. This modification is known as "Factorial Design."

The yields per acre quoted in this report are those actually harvested from the plots. Such yields are considerably higher (up to

20 per cent.) than would be the case if it were not necessary to have paths between the plots. Much sampling of plots has been done to ascertain if there has been a differential response by varieties or rate of seeding to this pathway effect, but no indication of any such effect has been found, and overseas literature shows the same result. However, when studying the figures, due allowance should be made for this pathway effect.

CEREAL EXPERIMENTAL WORK

Wheat is by far the most important crop in the Mallee. The area sown to wheat in the Mallee is approximately half the Victorian acreage, and production is about one-third of the Victorian total yield. Oats are sown on about 340,000 acres, compared with approximately 1,231,000 acres of wheat. Barley production is confined in the Mallee principally to the Rainbow, Beulah, and Hopetoun districts.

The production of new, superior varieties of wheat and oats by hybridization and selection, and their subsequent development and testing, provides one of the most important and extensive aspects of the research work being conducted on the station.

Wheat Variety Trials

In this section, standard varieties and promising new crossbreds are tested, both at the Research Station, and at the associated farmers' plots. The results of these trials are summarized in Table 1. It will be seen that Insignia has given highest yields at each centre where it has been tested.

Bencubbin and Regalia have each given slightly higher yields than Ranee 4H. In the main, the later maturing varieties have not yielded as well as the earlier maturing ones. Both Quadrat and Pindar have given better yields than Ghurka. Pinnacle (a selection from Pindar), released for Wimmera sowing early this year, has given slightly better yields than its parent variety in the Mallee. Ghurka x Pusa 4 V9–2 is of particularly good flour quality, and is being multiplied for commercial testing. As its yielding ability is below that of the standard wheats, payment of a premium for quality is being considered by the Victorian Millowners' Association.

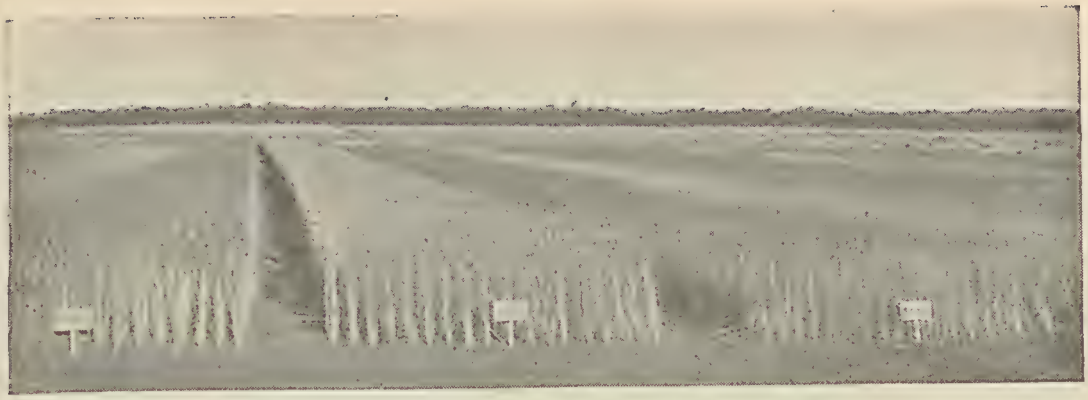
Javelin is a wheat recently named by Roseworthy College, and its performance to date has been very encouraging. However, it will require testing over a longer period before it can be recommended for Mallee sowing.

Recommended Wheat Varieties for Mallee Sowing

Each year, The Victorian Wheat Advisory Committee, consisting of representatives of the wheatgrowers, millers, bakers, and the Department of Agriculture, after consideration of the yield performances, quality characteristics, disease resistance, and field characteristics of the various varieties, issues a table

TABLE 1.—WHEAT VARIETY TRIALS IN THE MALLEE.
Yields in bushels per acre.

Variety.	Mallee Research Station—Walpeup.			Berriwillock.	Werrimull.	Swan Hill.	Woomelang.		Ultima.	
	Average Thirteen Years, 1933–45.	Average Six Years, 1940–45.	Average Three Years, 1943–45.	Average Four Years, 1942–45.	Average Five Years, 1937–41.	Average Three Years, 1937–39.	Average Five Years, 1941–45.	Average Three Years, 1943–45.	Average Five Years, 1941–45.	Average Three Years, 1943–45.
Insignia	..	18·3	11·7	15·4	..	..	17·7	13·7	9·6	8·9
Regalia	23·8	16·6	10·5	13·5	12·0	27·6	16·7	12·6	9·1	8·0
Ranee 4H ..	23·4	16·2	10·7	14·0	11·5	27·7	16·6	13·2	8·8	8·1
Bencubbin ..	24·3	16·9	11·0	..	11·7	27·7	16·9	12·7	9·0	7·8
Pindar	..	15·9	10·1	12·9	10·5	28·1	13·0	12·2	7·5	7·6
Quadrat	..	17·0	11·5	14·1	..	..	13·8	12·2	7·9	8·5
Ghurka	21·3	15·2	9·7	12·6	10·1	26·9	12·4	11·8	7·7	7·8
Pinnacle	..	..	10·7	..	..	..	..	12·7	..	8·1
Javelin	..	..	11·8	..	..	..	..	..	..	..
Ghurka x Pusa4 V9–2	..	16·5	10·3	..	..	..	..	11·7	..	7·3



Wheat Variety Trials at the Mallee Research Station.

of recommended varieties for each district. *The current recommendations for the Mallee are :—*

—	Main Sowing.	Limited Sowing.
Northern Mallee	Regalia	Insignia
,, ,, ...	Ranee 4H	
,, ,, ...	Bencubbin	
,, ,, ...	Pindar	
Southern Mallee	Ghurka	Insignia
,, ,, ...	Ranee 4H	Bencubbin
,, ,, ...	Regalia	Quadrat
,, ,, ...	Pindar	

Table 2 sets out the percentage of the total area sown to each variety of wheat last year, and at other representative periods since the inception of the Walpeup Station. It will be seen that four varieties which were in the first ten in 1931 are still included in the table—namely, Ranee 4H, Ghurka, Free Gallipoli, and Sepoy. The table indicates the rapidity with which new wheats have displaced the older varieties.

In addition to the varieties included in Table 1, new varieties from other States are tested at Walpeup as soon as seed is obtained. These new varieties are tested in the same series of plots as the more promising locally selected crossbreds. If their yields in this trial are satisfactory, they are promoted to the Senior Yield Trial. Because the varieties in this trial are frequently changed, the average yields over a long period cannot be given.

TABLE 2.—TEN PRINCIPAL WHEAT VARIETIES SOWN IN THE MALLEE.

Variety.	Percentage 1945–46.	Percentage 1940–41.	Percentage 1935–36.	Percentage 1931–32.
Ghurka ..	26·8	41·1	25·4	·9
Pindar ..	16·7	..	..	..
Bencubbin ..	12·8	7·7	0·3	..
Ranee 4H ..	12·1	27·7	18·2	18·5
Quadrat ..	11·8	..	..	..
Regalia ..	8·5	3·3	..	..
Dundee ..	2·2	3·7	..	..
Bobin ..	1·9	2·9	0·7	..
Free Gallipoli	1·5	4·2	20·7	27·3
Sepoy ..	1·4	2·6	8·0	9·9
Total acreage	1,566,000	1,237,000	1,126,000	2,004,000

The yields of the more promising crossbreds, compared with named varieties for the limited periods, are shown in Table 3, on the following page.

Koorda was bred in Western Australia, it being a cross between Nizam and Nabawa. It is an early maturing wheat, medium tall-growing and has white-chaffed heads. It is very resistant to flag smut. The flour strength is about equal to that of Bencubbin.

Ridley was bred at the Waite Institute, Adelaide, being the result of a cross between Nabawa and Hard Federation. It is an

Visitors inspecting the experimental plots at Walpeup on field day.

early mid-season variety, has white chaff, and the grain is hard and vitreous. Warigo was also bred at the Waite Institute, and is a cross between Nabawa and Hope. It is a rust resistant variety, and is also resistant to flag smut, loose smut and mildew.

TABLE 3.—WHEAT VARIETY TRIAL.
(New Wheats and Crossbreds.)

Variety.	Average (Two Years, 1944–45).	Average (Four Years, 1942–45).
	bus./ac.	bus./ac.
Koorda	12·0	18·4
Insignia	11·9	..
Ridley	11·6	..
Warigo	11·0	16.9
Kondut	10·6	..
Pindar Selection W98 A2 ..	10·4	..
Rance 4H	10·2	18·0
Quadrat	9·9	..
Pindar Selection W169 A1 ..	9·2	..
Charter	8·9	..
Scimitar	8·8	16·9

Kondut was released in 1943 by the Western Australian Department of Agriculture. It is derived from a cross between Wilfred and Sutton, is medium to tall-growing, of medium maturity, and produces flour of slightly better strength than F.A.Q.

Charter was released in 1944 by the N.S.W. Department of Agriculture. It was bred at Glen Innes from a cross between an unnamed Kenya wheat and Gular. It is a tall-growing, white-chaffed very early maturing wheat, and produces grain of good flour quality.

Scimitar was bred at Roseworthy College, being the result of a cross between Nabawa and Egyptian 4. It is of mid-season maturity, but at this station has shown a marked tendency to "tip" during a dry spell in the spring.

Discarded Varieties

Variety tests in the past have resulted in the elimination of many wheats owing to lower yielding ability, poor grain quality, disease susceptibility or other factors. The wheats now eliminated from the yield trials include Federation, Early Gluyas, Mac's White, Yandilla King, Currawa, Nabawa, Joffre, Sepoy, Waratah, Free Gallipoli, Magnet, Carrabin, Ford, Baringa, Merreden, Riverina, Totadgin, Nawab, Sword, and Rapier.

Tests on Stubble Land

The area of wheat crop in the Mallee sown on stubble land each year varies according to seasonal conditions but averages in the vicinity of 15 per cent. of the total area sown to wheat. To provide information on crops sown under these conditions, wheat variety trials on stubble land were introduced. The results obtained so far indicate that an early maturing wheat is desirable for stubble sowing.

TABLE 4.—WHEAT VARIETY TRIALS ON STUBBLE.

(Average yield 4 years, 1937–40.)

Variety.	Bushels per Acre.
Rance 4H	11·0
Regalia	10·8
Bencubbin	10·2
Ghurka	10·0

[continued on page 434

INFECTIOUS PNEUMONIA OF SWINE

Prevention and Control

By C. POPE, B.V.Sc., *Veterinary Officer*

Sanitation is provided here by rotational stocking of small paddocks which are equipped with movable shelter-sheds and self-feeders.

INFECTIOUS pneumonia of swine, or as it is more commonly termed Swine Plague, is a common and rather widespread disease in pigs, and owing to its insidious nature it represents a constant and steady loss of revenue to the Victorian pig industry. The name Swine Plague was originally introduced from Europe, where it is used to designate a condition in pigs similar to, but not the same as, that seen in Victoria. Here, the name Infectious Pneumonia is more applicable as it is scientifically correct and is descriptive of the disease.

In Victoria it has been proclaimed under the Stock Diseases Act, and it is therefore incumbent upon every pig owner, who suspects the existence of infectious pneumonia amongst his pigs, to report his suspicions to the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2, or to the Stock Inspector for his district. Advice will then be given with regard to the necessary steps for the control and eradication of the disease on the property and the procedure which should be adopted to prevent the spread of the disease to other properties. Under the name swine plague, infectious pneumonia has also been proclaimed under the Swine Compensation Act, which offsets much of the hardship to which an owner might be put in ridding his piggery of the disease.

In nature, the disease is essentially a pneumonia of an infectious type, though the acute form may also be classed as a septicaemia. It is caused by an organism or germ which belongs to the group known as the *Pasteurellae.*

Lowered Resistance Favours Disease

The germ may be carried by pigs which in good, clean, hygienic quarters will show

little or no evidence of being infected, but it becomes activated and assumes an increased virulence as the result of the lowering of the pigs' vitality and resistance. Exposure, irregular and bad feeding, faulty sanitation and hygiene, transportation, &c., are some of the factors that will reduce the resistance of a pig and allow the germ to set up the disease. With its added degree of virulence, the germ starts a focus of a disease which is highly infectious and will soon spread through the piggery, causing serious trouble and loss. Faulty management, therefore, may indirectly permit entry of the disease on an apparently hitherto disease-free property.

Symptoms

The course of the disease varies greatly from a very acute type in which sickness is obvious and death may follow in 12 to 24 hours after the onset of symptoms, to a chronic type in which symptoms are practically absent and the affected pig may even appear to thrive. In acute cases there is a high fever with temperatures up to 106° F. and consequent loss of appetite. The sick animal mopes and loses interest in its surroundings. The gait of the affected pig is usually of a staggery nature, and pneumonia is manifest by the uneven, difficult, and jerky breathing, and sometimes by a short frequent cough. Diarrhoea may set in and hasten death. Bluish-red or purple blotches may appear in the skin and are especially noticeable in white pigs.

In the less acute cases the above mentioned symptoms are modified, and in the chronic form of the disease only the pneumonic symptoms will be noticeable as the symptoms induced by fever are absent. Such chronic cases represent a real danger as affected pigs will apparently do fairly well and may even put on weight and fatten, yet remain a constant source of infection to healthy pigs.

A hurried examination will not reveal the chronically affected animal; but time and patience and a close study of the normal respiratory or breathing movements of a healthy pig, will sometimes allow a confident diagnosis of the chronic type of infectious pneumonia to be made. Respiratory movements of the pig are best studied by a careful observation of the movement of the flanks. In the healthy animal the flank movements, coinciding with breathing, are even and smooth; in the pneumonic pig there is a noticeable jerk or kick associated with each movement of the flank as extra muscular exertion is required in the effort to overcome the disability of the non-functioning portions of the lung. It is this "kick in the flank" which is so typical of infectious pneumonia of swine. It is quite obvious in acute and less obvious, but still noticeable, in chronic cases.

Post-Mortem Findings

In a pig that has died in the acute stage of the disease, nothing of an obvious nature may be seen when the carcass is opened up. There will be a degree of congestion of the lungs and the associated lymph glands will be blood-stained. Some early pleurisy may also be evidenced by discolouration of the membrane covering the lungs. A close examination will reveal tiny pin-point hæmorrhages under serous and mucous membranes and on the surfaces of the kidneys, especially when the capsules of those organs have been peeled off.

If the animal dies or is killed in a less acute or chronic stage of the disease, definite pneumonic lesions will readily be recognizable in the lungs. These lesions are usually found at the extremities of the apical or cardiac lobes of the lung and take the form of reddish consolidated areas of lung tissue. Associated with these lesions is often a degree of inflammation of the stomach and intestines. In diagnosing, remember that normal lung tissue is quite spongy to the feel, while pneumonic lung feels firm and solid and resists the pressure of the fingers. A simple test that can be carried out to differentiate normal from pneumonic lung is to cut off the suspected portion and place it in a small quantity of water; pneumonic lung will sink whereas normal lung will float.

If pneumonia is diagnosed at post-mortem it will be necessary to make sure that it is not due to a lungworm infestation, but this can be readily done as lungworm pneumonia usually appears as a triangular area in the basal or diaphragmatic portion of the lung, and if the smaller air passages are traced out the offending lungworm can be seen. Further, the pneumonia may be due to the irritation caused by the passage of the larvae of the round worm *Ascaris*

lumbricoides, but these lesions are very small and scattered and not confined as they are in infectious pneumonia.

If infectious pneumonia is suspected, the lungs should be preserved in a solution containing 4 fluid ounces (eight tablespoons) of formalin in a gallon of water, pending a visit from the local Stock Inspector, who should be notified at once.

Good Management a Vital Preventive Measure

It has already been stated and may be stressed again that the occurrence of the disease on a property can be prevented by good management. If strong robust litters are bred and are brought along in hygienic surroundings without receiving a growth check or being brought into contact with diseased pigs, there need be little fear of the ravages of infectious pneumonia. Two systems of pig raising are commonly adopted in Victoria, namely, the open-air or paddock system and the sty system. Of the two the Department of Agriculture has always been an advocate of the former. This expression of opinion is based on many years, experience in dealing with diseases of pigs, and it has always been noticed that in comparable conditions, hardier, healthier, and more robust pigs are bred and reared in the paddock than in the sty.

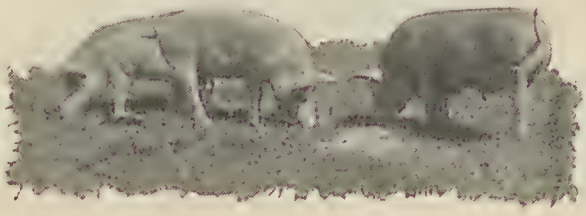
The selection of a site for a piggery is a matter of prime importance, as good drainage is essential and the soil should be of such a nature that it will not become a quagmire in wet periods. It should also be capable of growing a good pasture.

The pigs' quarters should be clean, dry, warm and free from draughts, yet provided with good ventilation. These factors should be carefully considered when sheds and sties are being planned. Ease of cleaning should also be considered when plans are being prepared, for if a shelter shed can be cleaned and disinfected easily, it is usually cleaned and disinfected well.

Feeding should always be regular and the diet balanced to suit the requirements of the various types of pigs.

Transportation and exposure in markets are very real factors in reducing the vitality and resistance of pigs, thus allowing the germ or organism of infectious pneumonia to gain the ascendency and initiate the disease. The buyer of store pigs is always likely to experience an outbreak of this disease. A history of deaths or sickness in a piggery following a recent introduction of purchased pigs is always highly indicative of infectious pneumonia. When it is necessary to introduce new pigs into the piggery, every precaution should be taken to ensure that they do not bring in and disseminate disease. Be sure that the pigs come from a property that has no recent history of infectious pneumonia and that the pigs are strong and robust before purchase. On the journey attend to the comfort of the pigs to reduce the possibility of a check with its consequent lowering of resistance. At the piggery, the pigs should be received into a pen or paddock and completely isolated. They should remain under quarantine and observation in this paddock for a period of three weeks, before being allowed to come into contact with other pigs on the property. The acute or virulent form of disease, if present, can usually be detected during this quarantine period of three weeks, and its spread is thus controlled. While this procedure is not 100 per cent. effective in preventing the introduction of disease, it does minimize the danger, firstly of buying the disease, secondly of incubating the disease during transport, and thirdly of disseminating it through an otherwise disease-free piggery.

There is no known treatment or cure for infectious pneumonia of swine, nor any vaccine or serum that can be used as a preventative or which will give any protective immunity to the disease.



ORCHARD NOTES

Black Spot on Apples and Pears — Spraying Programmes

By G. W. GAYFORD, B.Agr.Sc., *Horticultural Instructor*

Fig. 1.—(Left) Apple blossom buds showing "green tip" stage. The bud scales have separated from the majority of the fruit buds and the tips of the green folded leaves are just visible. Fig. 2.—(Right) "Early pink" stage of apple blossom.

APPLES

IF the weather during the spring is wet and humid there is always a danger of a serious outbreak of black spot (*Venturia inaequalis*) in apple orchards. Infection in the spring must be prevented by protective sprays, otherwise re-infection may occur throughout the growing season and cause extensive damage to the apple crop.

This fungous disease causes black sooty scabs, varying in size from a pin-head to a shilling, to appear on the skin of the fruit. Early infection frequently produces cracks in the growing fruit. Leaf infection occurs in the form of dark patches which do not entirely obscure the green of the leaf. The carryover of infection from one season to the next is through the infected leaves, in which the fungus lies dormant. With rising temperatures during September and October, and provided sufficient moisture is available, spores in large numbers are discharged into the atmosphere, where they are blown around in the wind and alight on the fresh young growth then appearing on apple trees. If this growth, due to wet weather, is kept damp for a sufficiently long period, the spores germinate and active growth of the fungus commences.

Disposal of old infected leaves by early ploughing will reduce the possibility of infection. This must be done before bud burst. Ploughing should not be done during the flowering period because stirring of the leaves will increase the discharge of spores.

Spray Programme

The various stages of growth at which sprays are applied are as follow :—

Green Tip—This is recognized when the bud scales have separated from the majority of the blossom buds and the tips of the green folded leaves are just visible. (Fig. 1.)

Finger—The young green leaves have separated from the blossom buds which are beginning to separate in the cluster.

5 *to* 10 *per cent. Blossom*—i.e., when 5 to 10 per cent. of the flowers have opened. (Fig. 2.)

Petal-fall—i.e., when the majority of the petals have fallen.

Schedule 1

For varieties liable to russet, such as Jonathan, London Pippin, Yates, Rokewood, Gravenstein, &c., the following schedule :—

At the "Green Tip" stage apply Bordeaux mixture 6 : 4 : 40.

At the "5 to 10 per cent. Blossom" stage apply lime-sulphur (20 per cent. polysulphide content) $2\frac{1}{4}$: 80.

At the "Petal-fall" stage apply lime-sulphur (20 per cent. polysulphide content) $1\frac{1}{2}$: 80.

At a stage 14 *days after the petal-fall application*, apply lime-sulphur (20 per cent. polysulphide content) 1 : 80. See below *re* combination of lime-sulphur with arsenate of lead. For the Jonathan variety, Bordeaux mixture should be applied at a *slightly earlier* stage than the "Green Tip" described above.

SCHEDULE 2 (THE BORDEAUX SCHEDULE)

This programme is suitable *only for varieties which do not russet readily* and should not be used for Jonathans, London Pippin, Yates, Rokewoods, and Gravensteins.

At the "Green Tip" stage, apply Bordeaux mixture 6 : 4 : 40.

At the "Finger" (no later) stage, apply Bordeaux mixture 3 : 3 : 50.

Bordeaux mixture of strength 6 : 4 : 40 contains 6 lb. of copper sulphate, 4 lb. of burnt (unslaked) lime. If slaked lime is used, the 6 : 4 : 40 formula becomes 6 : 6 : 40, the 3 : 3 : 50 becomes 3 : 4 : 50, and the 1 : 1 : 50 becomes 1 : $1\frac{1}{2}$: 50.

Fig. 3.—(Left) The "delayed green tip" stage of pears.
Fig. 4.—(Right) Pear blossom showing finger stage.

For the protection of trees during the summer, sprays of lime-sulphur 1 gallon in 80 should be used. To save time and labour it may be necessary to combine lime-sulphur with lead arsenate for the "petal fall" and later sprays. To prevent damage resulting from the production of soluble arsenic in this combination, lead arsenate should be added to the dilute lime-sulphur with which half a pound of lime casein spreader or 2 lb. slaked lime has been mixed.

Where summer white oil emulsion is used in the spray programme for codling moth control, it should not be applied to trees within three weeks of a lime-sulphur spray, otherwise severe damage may result.

PEARS

Black spot on pears (*Venturia pirina*) is a similar disease to that on apples and the remarks regarding mode of infection for apples apply also to pears.

Spray Programme

The various stages of growth at which sprays are applied are as follow:—

Delayed Green Tip—When the maximum number of blossom buds have brown scales (bracts) separating and tips of green folded leaves are just visible. (Fig. 3.)

Finger—When green leaves are separated from blossom buds which are beginning to separate in the cluster, *but before white petals appear.* (NOTE.—Odd blossoms only may be showing white petals.) If a 6 : 4 : 40 Bordeaux mixture spray is applied later than this stage, russet may occur. (Fig. 4.)

Late Calyx—About three weeks after the fruit has formed.

WILLIAMS, BEURRE BOSC

At "Delayed Green Tip" stage apply Bordeaux mixture 6 : 4 : 40.

At "Finger" stage apply Bordeaux mixture 6 : 4 : 40.

At "Late Calyx" stage apply Bordeaux mixture 3 : 3 : 50.

(This may be used in combination with the arsenate of lead spray.)

Josephine and Winter Cole

Only one Bordeaux mixture spray (6 : 4 : 40) should be applied, and this will be at an early *Green Tip* stage. This stage is slightly earlier than that described above as "Delayed Green Tip". Any further Bordeaux mixture sprays will russet this variety.

Winter Nelis and Madame Cole

At "Delayed Green Tip" stage apply Bordeaux mixture 6 : 4 : 40.

At "Finger" stage apply Bordeaux mixture 6 : 4 : 40.

(This application *must be completed before any petals* show pink.)

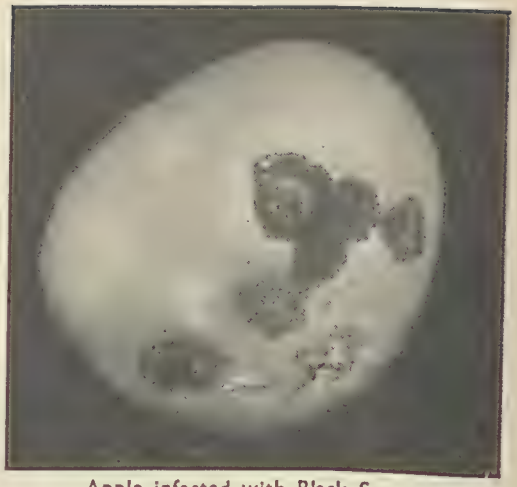
At "Late Calyx" stage apply Bordeaux mixture 3 : 3 : 50. This spray *must not be applied within three weeks after petal fall.*

(This spray may be combined with the arsenate of lead spray.)

Packham's and Other Clean-skinned Varieties

At "Delayed Green Tip" stage apply Bordeaux mixture 6 : 4 : 40.

At "Finger" stage apply Bordeaux mixture 6 : 4 : 40.



Apple infected with Black Spot.

At "Late Calyx" apply Bordeaux mixture 1 : 1 : 50.

(This may be combined with the arsenate of lead spray.)

Control of Summer Spot

Infection late in the season arises from primary infection caused in the early spring. If spring spraying is efficiently carried out, little trouble need be expected from summer spot. If summer black spot does appear, a Bordeaux mixture 1 : 1 : 50 can be applied, either alone or combined with an arsenate of lead spray, to Williams', Bosc, and Packhams. For Josephine, 6 oz. bluestone and 6 oz. freshly slaked lime can be added to 80 gallons of arsenate of lead spray, for the control of summer spot.

CODLING MOTH CONTROL

D.D.T. TRIALS IN VICTORIA

By T. W. HOGAN, B. Agr. Sc., *Senior Entomologist, and*
R. M. STEPHENS, B.Sc., *Assistant Entomologist, Biological Branch*

THE development of improved methods for codling moth control in apples and pears giving an increase of even 1 per cent. of clean fruit would represent a saving of approximately £20,000 per annum to Victorian fruitgrowers. Because of the possibilities of obtaining a marked improvement in the control of this pest, field experiments with the new insecticide, D.D.T., were commenced during the season 1945–46 in three separate districts and on both apples and pears. The tests will be continued for several seasons.

Before D.D.T. can be established soundly in horticultural practice, however, it must measure up to the following requirements :—

(*a*) To be as good or better than insecticides previously used for the control of the particular insect pest in terms of both insecticidal efficacy and economy.

(*b*) To be non-injurious under particular local conditions to orchard trees which are sprayed with the insecticide.

(*c*) To produce no major problem by the killing of beneficial insects or other organisms.

(*d*) To be safe for the person who uses the insecticide, or who consumes the produce which has been sprayed with it.

The initial performance of D.D.T. in relation to these requirements is given in the following account of the 1945–46 codling moth experiments in Victoria.

METHOD

Single tree plots with six randomized replicates to each of three treatments were used, the treatments being separated by single rows of buffer trees in both directions. An overlying treatment, either of a different strength D.D.T., or trunk spraying, was also included. Trunk spraying comprised a thorough spraying of the trunks of half the trees in each of the plots with D.D.T., at the same strength and same time of application as the foliage spray, with the object of killing larvae migrating to the trunk to pupate. A fourth plot consisted of four replicates of two-tree plots with a single row of buffers between treatments.

At the time these tests were instituted only one D.D.T. horticultural spray was commercially available in Victoria. This was a 20 per cent. D.D.T. concentrate[1], and it was considered desirable to compare the performance of this material with a miscible type of concentrate[2] which had been widely used in experimental work in Australia. Each material contained D.D.T. with a para para isomer content of 95 per cent.

Timing of spray applications being an important factor in the efficiency of lead arsenate, it was decided to follow the normal lead arsenate schedules, based on lure catches, for both the lead arsenate and D.D.T. sprays.

The trees in all instances were sprayed until a "run-off" was apparent. The spray pressure used was 250–300 lb./sq. inch.

The Tatura Trial

The trial in the Tatura district was conducted on Williams' bon Chretien pears which had been sprayed with red oil 1 : 20 during the previous winter. Following development of red spider and Bryobia mite late in the summer, the trees were sprayed with white oil emulsion 1 in 80 after the fruit had been picked. The average codling moth infestation on these plots is given in Table 1. A statistical analysis has shown that the difference between lead arsenate and the D.D.T. treatments is highly significant, but between the two D.D.T. treatments non-significant.

1. A product of Imperial Chemical Industries containing 20 per cent. D.D.T. and a petroleum solvent, referred to hereafter as Emulsion A.
2. From a formula prepared by the Division of Entomology, Council for Scientific and Industrial Research, containing 15 per cent. D.D.T. and coal tar solvent naphtha, referred to hereafter as Emulsion B.

TABLE 1.—SHOWING CODLING MOTH DAMAGE TO WILLIAMS' BON CHRETIEN PEARS ON EXPERIMENTAL PLOTS AT TATURA.

Treatments.	Stings.	Entries.	Total Damaged Fruit.	Clean Fruit.
	%	%	%	%
D.D.T. 0·1 per cent. emulsion A,, calyx and four cover sprays ..	0·8	0·3	1·1	98·9
D.D.T. 0·1 per cent. emulsion B, calyx and four cover sprays ..	0·6	0·4	1·0	99·0
Lead arsenate 5 lb., white oil ½ gallon to 80 gallons water. Calyx and four cover sprays ..	0·9	5·4	6·3	93·7
Overlying Treatment.				
Trunks sprayed with 0·1 per cent. D.D.T., emulsion A ..	0·8	2·8	3·6	96·4
Trunks not sprayed ..	0·8	1·9	2·7	97·3

Half of the trees in these plots were given the trunk spraying treatment, but no significant difference in the percentage of infested fruit was obtained. Larvae were also found over-wintering in the bark around the butts of these sprayed trees.

The most important secondary effect in these trees was the development of Bryobia Mite (*Bryobia praetiosa*) and Red Spider (*Tetranychus urticae*). Bryobia mite was first noticed when the fruit were nearing maturity, whereas red spider appeared later, but built up more rapidly.

In a count (using a sample of 20 leaves per tree) made several weeks after picking the fruit, Red Spider averaged 11 per leaf and was present on all trees, while Bryobia mite was found only on the D.D.T. sprayed trees and averaged 4·0 per leaf. After leaf fall, it was observed that numerous Bryobia eggs had been deposited on the D.D.T. sprayed trees but few on the lead arsenate trees.

On the trees sprayed with D.D.T., leaf fall occurred later than from the lead arsenate trees. A difference in the general appearance of the D.D.T. sprayed trees seemed to be caused by a lengthening and twisting of the petioles of the leaves, and the same effect was observed in the plots in other districts.

D.D.T. residues ranged from 0·7 to 15·3 p.p.m., with an average of 6·3 p.p.m. In this connection, a difference in the two emulsions occurred, the deposit from emulsion A averaging almost double that of the emulsion B.

Shepparton-East Trial

W.B.C. pears were also used in the Shepparton East district, but in this instance, the trees had been sprayed with pale oil just prior to bud-burst. In these plots (Table 2) statistical analysis has shown that the differences between the D.D.T. treatments and the lead arsenate treatment is highly significant, but that the differences between the two types of D.D.T. emulsion or from trunk spraying are non-significant.

TABLE 2.—SHOWING CODLING MOTH DAMAGE TO WILLIAMS' BON CHRETIEN PEARS ON EXPERIMENTAL PLOTS AT SHEPPARTON-EAST.

Treatments.	Stings.	Entries.	Total Damaged Fruit.	Clean Fruit.
	%	%	%	%
D.D.T. 0·1 per cent., emulsion A, calyx and four cover sprays ..	0·3	0·4	0·7	99·3
Lead arsenate calyx spray and four cover sprays of 0·1 per cent. D.D.T. emulsion A ..	0·0	0·3	0·3	99·7
Lead arsenate 5 lb., white oil ½ gallon to 80 gallons water, calyx and four cover sprays ..	1·1	14·2	15·3	84·7
Overlying Treatment.				
Trunks sprayed with 0·1 per cent. D.D.T., emulsion A ..	0·4	3·9	4·3	95·7
Trunks not sprayed ..	0·5	5·3	5·8	94·2

No mites were seen in these plots up to the time of picking of the fruit. A few were observed just prior to leaf fall and a light deposit of Bryobia eggs was later found on the D.D.T. sprayed trees. The development of mites has thus not been a problem over this season, but the effect of treatment over successive seasons may be more marked.

In these plots, as in the others, the D.D.T. sprayed trees were a lighter shade of green than the lead arsenate sprayed trees, quite distinct from the difference in the appearance of the trees caused by the spray residue. Leaf fall on the D.D.T. trees was later than from the remainder of the trees.

Blackburn Trials

TABLE 3.—SHOWING CODLING MOTH DAMAGE TO JONATHAN APPLES ON EXPERIMENTAL PLOTS AT BLACKBURN.

Treatments.	Stings.	Entries.	Total Damaged Fruit.	Clean Fruit.
	%	%	%	%
D.D.T. 0·1 per cent. and D.D.T. 0·2 per cent. emulsion A, calyx and five cover sprays	0·9	0·2	1·1	98·9
D.D.T. 0·1 per cent. and D.D.T. 0·2 per cent. emulsion B, calyx and five cover sprays	0·5	0·0	0·5	99·5
Lead arsenate 5 lb. to 80 gallons water, calyx and five cover sprays ..	2·6	5·8	8·4	91·6
Overlying Treatment.				
D.D.T. 0·1 per cent., emulsion A and emulsion B, calyx and five cover sprays	0·8	0·1	0·9	99·1
D.D.T. 0·2 per cent., emulsion A and emulsion B, calyx and five cover sprays	0·6	0·1	0·7	99·3

(*a*) *Jonathan Apples.*—No winter spray for mite control was given these trees. Statistical analysis has shown the difference between the percentage of codling moth infestation in the lead arsenate treatment and the two D.D.T. treatments to be highly significant and between the two D.D.T. treatments significant at the 5 per cent. level. The difference in infestation of the two strengths of D.D.T. is not significant.

No mite development was apparent up to picking time, but both Bryobia mite and red spider were found on the leaves some weeks later.

With double strength emulsion small dark brown spots around the lenticels were apparent in all the fruit, and since it occurred in only one of the two D.D.T. treatments, seems more likely to have been caused by the solvent in this emulsion rather than the D.D.T. The effect was only skin deep, and the keeping quality of the apples has not been affected up to the time of writing. The foliage on all D.D.T. sprayed trees was of a lighter shade than the remainder of the plots and leaf-fall was later.

D.D.T. residues ranged from 4 p.p.m. to 37 p.p.m. with an average of 15 p.p.m.

(*b*) *Packham Pears.*—No winter spray was applied to these trees. The difference in infestation (Table 4) between D.D.T. and lead arsenate is highly significant, but no significant difference resulted from trunk spraying.

TABLE 4.—SHOWING CODLING MOTH DAMAGE TO PACKHAM PEARS ON EXPERIMENTAL PLOTS AT BLACKBURN.

Treatments.	Stings.	Entries.	Total Damaged Fruit.	Clean Fruit.
	%	%	%	%
D.D.T. 0·1 per cent., emulsion A, calyx and five cover sprays	0·1	..	0·1	99·9
Lead arsenate 5 lb. to 80 gallons water, calyx and five cover sprays	15·1	0·9	16·0	84·0
Overlying Treatment.				
Trunks sprayed with 0·1 per cent. D.D.T., emulsion A ..	0·4	7·6	8·0	92·0
Trunks not sprayed ..	9·1	0·6	9·7	90·3

The D.D.T. sprayed trees were noticeably lighter in colour, and in this instance, no mites were found on the trees. The D.D.T. residues ranged from 0·9 p.p.m. to 15·2 p.p.m. with an average of 5·7 p.p.m.

SUMMARY

D.D.T. has given excellent control of codling moth in tests conducted in three separate localities in Victoria. Spraying the trunks and butts of the trees with D.D.T. emulsion did not give any improvement in control. Development of mites occurred late in the season on several plots, but although they were not a serious problem, the cumulative effect of several season's spraying will be of special interest. The foliage of D.D.T. sprayed trees was lighter in colour than those sprayed with lead arsenate, and leaf fall occurred later.

The two types of emulsion tested were equally effective on all except one of the plots, but the D.D.T. residues were higher on emulsion A and a reaction attributed to the solvent occurred on apples sprayed with emulsion B. Analyses of fruit for D.D.T. showed that some of the residues were beyond the statutory limit, but the development of schedules giving lower residues should not be difficult.

As more than one season's results will be required before the importance of any secondary effects can be determined, the Department of Agriculture is not making any recommendations regarding the use of D.D.T. for codling moth control by growers for the season 1946–47.

Acknowledgments

The co-operation of Officers of the Horticultural Division who assisted with this work, namely, officers of the Horticultural Research Station, Tatura, Messrs. V. Lawrey, Shepparton East, and P. Greatorex, Blackburn, is gratefully acknowledged. Messrs. McDonald, Moore, and Simson, on whose properties the plots were situated, were extremely helpful in carrying out the spray schedules. Mr. H. B. Wilson, Assistant Entomologist, took part in these experiments for part of the season and his assistance was greatly appreciated. Statistical analyses were made by Mr. R. R. Leslie, Section of Mathematical Statistics, Council for Scientific and Industrial Research. D.D.T. spray residue analyses were made by the Victorian State Laboratories.

Department of Agriculture

Change in Location of Offices

Rearrangement of accommodation in the Head Office of the Department of Agriculture, Treasury Place, Melbourne, has made necessary the transfer of the Plant Investigation Section of the Department to the V.C.A. Building, 1 Collins Place, Melbourne. Visitors requiring information on potatoes, potato contracts, tobacco, flax, soya beans, maize or millets will find officers dealing with these subjects on the 3rd Floor of the V.C.A. Building, or may contact these officers by phone—Central 1281 or Central 5824.

Correspondence on these subjects may be addressed to the Department of Agriculture, Public Offices, Melbourne, C.2, or to 1 Collins Place, Melbourne, C.1.

THE FLOWER GARDEN

SPRING SOWINGS FOR THE SUMMER DISPLAY

By
T. H. KNEEN, B.Agr.Sc.,
Acting Principal, School of Horticulture, Burnley

THE burst of warm weather early last month may have stimulated many home gardeners into making sowings of various flower seeds in the open ground. However the soil is still too cold in August and there are the additional risks of cold snaps and frost extending into September, resulting in many disappointments. The latter part of September is sufficiently early to commence operations for the summer display. For late summer and autumn displays, sowing can be deferred until October and November.

For those who wish to raise their own seedlings, a small frame situated in an open sunny position can be used to protect the seed bed. The frame itself need only be 6 inches high and fitted with a frame to carry a hessian blind for protection from the sun. The soil need not be rich, but must be loose and friable to permit the germination of small seeds. If necessary, make up a compost of light loam with plenty of sand and some well-decayed leaf mould and cow manure. Avoid a mixture which cakes together when pressed tightly in the hand. A frame measuring 6 ft. x 3 ft. will be quite large enough for most gardens.

The main troubles encountered in raising seedlings are :—

Sowing small seeds too deeply ; watering with coarse sprinklers and dislodging the seeds ; failing to provide protection from the hot sun ; failure to water regularly ; allowing the bed to dry out. Failure to watch these points means a belated visit to the local florist for seedlings which could have been quite easily grown at home.

Summer Flowering Plants

Seeds of the following varieties can be sown from September right through to Christmas, and at intervals during that time, if a succession of blooming is required :—

Asters—excellent cut flowers, short blooming period, early plantings subject to wilt disease ; *Ageratum*—a good bedding plant ; *Amaranthus*—bright and showy foliage ; *Acrolinium*—everlasting flowers ; *Balsam* ; *Cosmos*—tall and dwarf types available ; *Cynoglossum*—blue flowers, similar to " forget-me-not ", growing up to two feet ; *Delphinium*—perennial, will flower following autumn ; *Dianthus*, *Gaillardias*, *Geum* ; *Godetia*, *Kochia*; *Marigolds*—tall varieties, such as Guinea Gold, Sunset Giant, and many dwarf varieties valued for bedding and border work, are available ; *Nasturtium*, *Nicotiana*; *Petunia*—available in many types and one of the most useful annuals, especially in strong sunlight ; *Phlox Drummondii*—an outstanding annual available in many colours, useful for cutting ; *Salvia*—bright strong coloring ; *Scabiosa*—good cut flower but rather untidy in the garden ; *Tithonia* (Mexican Sunflower)—better sown late, as otherwise it grows too tall ; *Verbena*—long blooming period, useful for rock work ; *Zinnia*–dahlia–flowered and lilliput types

[*continued at foot of next page.*

THE VEGETABLE GARDEN

Suggested Varieties for September Sowing and Planting

Vegetable.	Variety.	Seed or Plants.	Occupy the Ground for Approximately—
Carrot	Short Horn	Seed ..	5–6 months
	Danver's Half Long	,, ..	,,
	Red Chantenay	,, ..	,,
Parsnip	Hollow Crown	,, ..	6 months
Red Beet	Detroit Dark Red	,, ..	4–5 months
	Crimson Globe	,, ..	,,
Silver Beet	Dark-Green Broad-Ribbed	,, ..	6 months
Lettuce	Iceberg	,, ..	2–3 months
	New York	,, ..	,,
Pea	Greenfeast	,, ..	3–4 months
Cabbage	St. John's Day	,, ..	5 months
Turnip	White Stone	,, ..	3–4 months
Potato	Carman No. 1	,, ..	5 months
	Katahdin	,, ..	,,

FURTHER sowings may be made this month of the crops listed above. Seed of the cabbage variety, *St. John's Day*, may be added to the list for current sowings. Other crops which might be considered are green sprouting broccoli and leeks. The former is useful in small gardens and produces a succession of small cauliflower-like heads which can be cut over a period of three or four months. The cultural requirements are similar to those for cabbages and cauliflowers. The cabbage white butterfly grub appearing now will attack this crop and, therefore, protective dusts will be required.

The leek is one of the hardiest of vegetables, and is grown for the blanched stem and leaves. Used for salads and cooking, it is milder in flavour than the onion to which it is closely related. Seedlings are raised in a seed-bed and transplanted when 6 to 8 inches high, into a trench 4 to 6 inches deep. This is filled in gradually as the plants grow, until eventually 8 inches of the stem is buried. It matures in about 35 weeks and can be used in salads from about the 25th week. *Giant Musselburgh* and *London Flag* are well-known varieties.

The time is opportune to prepare ground for October sowings of French and climbing beans and sweetcorn. Beans give best results in medium to light sandy loams that have been deeply worked and well compacted. They can be grown with advantage in soils that have been heavily manured for leaf crops in which case the only fertilizer required is superphosphate. On light soils, it is preferable to use a 3 to 1 mixture of super. and potash.

If lime was not applied last autumn, 4 to 6 oz. of lime per square yard could be incorporated in the soil now. The superphosphate dressing can be deferred until sowing time.

Sweetcorn requires a fertile well-drained soil, provided it is well supplied with organic matter and situated in such a position that it warms up quickly in the spring. It will, therefore, be an advantage to prepare the soil now and incorporate liberal quantities of rotted stable manure, compost, &c.

THE FLOWER GARDEN (*continued from previous page*)

are useful cut-flowers; *Zinnia linearis*—a very fine bedding plant in gold and yellow.

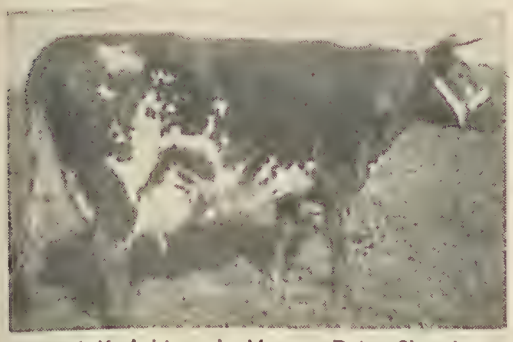
The above list may be helpful to those who find it difficult to make a selection from the bewildering array of plants which may be grown in the spring months. Some, of course, will be grown again and again in the garden because of their proved worth. Nevertheless, the aim should be to break away from a monotonous repetition of asters, petunias, marigolds, and zinnias year after year.

Cows Exceeding 500 lb. Butterfat

Class.	900 to 1000 lb.	800 to 900 lb.	700 to 800 lb.	600 to 700 lb.	500 to 600 lb.	Total.
Mature ..	..	2	2	14	81	99
Senior 4 ..	..	..	..	1	15	16
Junior 4 ..	..	..	1	4	15	20
Senior 3 ..	..	..	..	1	10	11
Junior 3 ..	..	..	..	..	8	8
Senior 2 ..	..	..	..	..	..	..
Junior 2 ..	..	..	..	..	..	..
Total ..	..	2	3	20	129	154*
Previous Year's Totals	1	..	1	18	97	117*

* Grand Totals.

All three juniors are by "Mornmoot War Hero," a son of "War Valour" (Imp.), which sired so many fine producers of "Mornmoot," his dam being "Mornmoot Fancy Madeira 4th," an Advanced Register cow from the famous Madeira strain.



Mr. W. K. Atkinson's Mature Dairy Shorthorn "Willow Park Duchess 35th", yielded 602 lb. butterfat.

"Daisy Bell 2nd," and "Lassie Bell 2nd," are from daughters of a son of old "Ballard Bonnie," whose 10-year average yield of 595 lb. butterfat stamped her as one of the greatest producers of the breed. "Bonnie Madeira" is a daughter of this famous cow, as also is "Bonnie Lass 2nd," which narrowly missed the Reserve Champion position last year when her yield was 750 lb. butterfat, the best of three years which averaged 700 lb.

The large Jersey herd of Messrs. G. A. McNabb and Son has two of its number in the coveted "over 600 lb." list. The over 600 lb. mature yield of "Maxon Graceful Duchess 5th," proves that her 591 lb. effort

"Inverbroom Air Marie", Mr. G. F. Wade's Junior four-year-old Jersey, produced 694 lb. butterfat.

Averages — 1945-46
273 Days Lactation Period

Class.	Number.	Average Butterfat for 273 Days without Allowances.	Average Butterfat for 273 Days with Allowances.
		lb.	lb.
Junior 2 ..	650	282	403
Senior 2 ..	258	302	403
Junior 3 ..	289	315	397
Senior 3 ..	221	338	398
Junior 4 ..	215	358	398
Senior 4 ..	186	344	364
Mature ..	933	367	..
Total ..	2,752	..	..

Average all Classes without Allowances—330 lb. butterfat.
Average all Classes with Allowances—385 lb. butterfat.

as a junior four, was not a fluke, while the remarkable yield of 735·3 lb. butterfat made by the junior-four, "Maxon Starbright's

This high-producing Friesian, "Upper Lappan Duchess", yielded 783 lb. butterfat. "Duchess" comes from the herd of Mr. G. L. S. Cowan, Bacchus Marsh.

Pansy 4th," proclaims her to be a very precocious young cow, and an exceedingly high producer.

A pleasing feature of this year's report is the early appearance of a number of new, or lesser known breeders, among the leaders of each class. Mr. G. F. Wade's "Inverbroom Air Marie," 694 lb. butterfat, and Messrs. Vaughan Bros'. "Lynroy Beta 5th," 687 lb. possess unusual merit. These performances in an average year would easily have won the junior four-class.

The "Lynroy" breeders also have a senior two-year-old included in the top six of her class, namely "Lynroy Heather" with 483 lb. butterfat.

An inherent weakness of reports that deal with figures in mass, as does the Standard Herd Test Report, is the difficulty of featuring all of the worthy individuals in it. The six leading herds, and the six best animals in each age group, represent but a small proportion of even the outstanding herds and cows.

Standard Herd Test Booklet

The Standard Herd Test Records for the quarter ended 30th June, 1946, and a full list of cows which have qualified to be placed in the Advanced Register of Merit, together with an introductory article, will appear in the Standard Herd Test Booklet, to be published early in October. Free copies of this booklet may be obtained from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

The Six Leading Cows in Each Section

Name of Cow.	Owner.	Class and Breed.	Butterfat.
		Mature.	lb.
Yarraview Ruby	Payne, A. E. T.	Guernsey	835·5
Yarraview Siren	Payne, A. E. T.	Guernsey	806·9
Yarraview Le Mode	Payne, A. E. T.	Guernsey	787·5
Upper Lappan Duchess	Cowan, G. L. S.	Friesian	783·3
Yarraview Chamois	Payne, A. E. T.	Guernsey	671·8
Yarraview Rougette	Payne, A. E. T.	Guernsey	654·3
		Senior four-year-old.	
Milvue Aim's Coronation	Jackson, H.	Jersey	611·1
Wilda Park Dream Girl	Prince, Mrs. H. A.	Jersey	573·9
Mer Vue Choice Light	Clarke, F. W.	Jersey	567·0
Ellendale Kirsty 50th	Bennett, J. W.	Jersey	565·7
Radford Bessie 2nd	Chester, E. N.	Jersey	558·6
Tooravale May 10th	Handbury, J. E. and Son	Jersey	557·8
		Junior four-year-old.	
Maxon Starbright's Pansy 4th	McNabb, G. A. and Son	Jersey	735·3
Inverbroom Air Marie	Wade, G. F.	Jersey	693·9
Lynroy Beta 5th	Vaughan Bros.	Jersey	687·1
Windrest Island Star 2nd	Haywood, Dr. A. R.	Jersey	645·5
Bamawm Princess Noella 2nd	Williams, L.	Jersey	627·1
Mornmoot Ovation	Chirnside, R. M.	Jersey	583·4
		Senior three-year-old.	
Surrey Bonnie Madeira 12th	Jackson, H.	Jersey	602·1
Bemersyde Bonnie 3rd	Cox, R.	Jersey	583·8
Pellew Ruth	McKenzie, A. E.	Jersey	579·1
Rutland Buttercup	Masters, S. H. and Son	Jersey	524·0
Ullina Madeira's Primrose	O'Neill, J.	Jersey	518·5
Ovalau Magnite	Waterhouse, H. W. and Son	Jersey	507·8

The Six Leading Cows in Each Section *(continued)*

Name of Cow.	Owner.	Class and Breed.	Butterfat.
		Junior three-year-old.	
Mornmoot Fancy Starbright 13th ..	Chirnside, R. M.	Jersey ..	591·6
Bamawm Bonnie Madeira	Williams, L.	Jersey ..	586·9
Mornmoot Fame	Chirnside, R. M.	Jersey ..	576·7
Deloraine Bunty 3rd	Broad, William A.	Jersey ..	549·8
Belgonia Eileen 18th	Maloney, P. J.	Jersey ..	534·1
Devon Park Victorious Madeira ..	Devon Park Stud Farm	Jersey ..	526·2
		Senior two-year-old.	
Belgonia Eileen 19th	Maloney, P. J.	Jersey ..	489·4
Lauriston Bluebelle 4th	Gardener Bros.	Jersey ..	483·3
Lynroy Heather	Vaughan Bros.	Jersey ..	482·6
Wattle Vale Sylvia	Dowel, A. E...	Jersey ..	482·3
Windrest Flying Beauty	Haywood, Dr. A. R.	Jersey ..	481·0
Dee Benita	Jackson, H.	Jersey ..	476·6
		Junior two-year-old.	
Bamawm Lassie Belle 2nd	Williams, L.	Jersey ..	478·5
Belgonia Junette 21st	Maloney, P. J.	Jersey ..	474·3
Pine Ridge Rose Dream 10th.. ..	Nancarrow Bros.	Jersey ..	464·0
Mornmoot Fancy Starbright 10th ..	Chirnside, R. M.	Jersey ..	448·8
Ryelands Ramona	Phillips, J. H.	Jersey ..	438·9
Eurarie Sparkle 3rd	Till, J. A.	Jersey ..	436·9

List of Cows, 600 lb. Butterfat or Over

Name of Cow.	Owner.	Class.	Breed.	Butterfat.
				lb.
Yarraview Ruby..	Payne, A. E. T.	Mature ..	Guernsey..	835·5
Yarraview Siren	Payne, A. E. T.	Mature ..	Guernsey..	806·9
Yarraview Le Mode	Payne, A. E. T.	Mature ..	Guernsey..	787·5
Upper Lappan Duchess	Cowan, G. L. S.	Mature ..	Friesian ..	783·3
Maxon Starbright's Pansy 4th ..	McNabb, G. A. and Son ..	Junior 4 ..	Jersey ..	735·3
Inverbroom Air Marie	Wade, G. F.	Junior 4 ..	Jersey ..	693·9
Lynroy Beta 4th	Vaughan Bros.	Junior 4 ..	Jersey ..	687·1
Yarraview Chamois	Payne, A. E. T.	Mature ..	Guernsey..	671·8
Yarraview Rougette	Payne, A. E. T.	Mature ..	Guernsey..	654·3
Surrey Buttercup 15th	Jackson, H.	Mature ..	Jersey ..	650·6
Windrest Island Star 2nd ..	Haywood, Dr. A. R.	Junior 4 ..	Jersey ..	645·5
Road's End Doramy	Stephens, Dr. F. G.	Mature ..	Guernsey..	642·9
Mornmoot Princess Madeira 9th ..	Chirnside, R. M.	Mature ..	Jersey ..	637·0
Mornmoot Northwood Madeira 14th	Chirnside, R. M.	Mature ..	Jersey ..	636·7
Bamawm Princess Noella 2nd ..	Williams, L.	Junior 4 ..	Jersey ..	627·1
Windrest Twinkle's Charm ..	Haywood, Dr. A. R.	Mature ..	Jersey ..	624·9
Windrest Chevy's Beauty ..	Haywood, Dr. A. R.	Mature ..	Jersey ..	611·4
Belgonia Junette 12th	Maloney, P. J.	Mature ..	Jersey ..	611·2
Mornmoot Princess Madeira 21st ..	Chirnside, R. M.	Mature ..	Jersey ..	611·2
Milvue Aim's Coronation	Jackson, H.	Senior 4 ..	Jersey ..	611·1
Leura Picaninny 12th	Axford, Estate of the late W. H.	Mature ..	Jersey ..	606·8
Bamawm Daisy Bell 2nd ..	Williams, Estate of the late F. A.	Mature ..	Jersey ..	606·3
Surrey Bonnie Madeira 12th ..	Jackson, H.	Senior 3 ..	Jersey ..	602·1
Willow Park Duchess 35th ..	Atkinson, W. K.	Mature ..	Dairy Shorthorn	601·7
Maxon Graceful Duchess 5th ..	McNabb, G. A. and Son ..	Mature ..	Jersey ..	600·4

HERD AVERAGES 1945-46

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average Butter-fat without Allow-ances.	Average Butter-fat with Allow-ances.
		No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.		
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.	lb.
HERDS OF 25 COWS AND OVER																		
1. Chirnside, R. M.	Jersey ..	12	376·1	..	..	5	523·2	1	423·3	6	522·9	..	..	6	534·9	30	463·3	542·1
2. Maloney, P. J...	,, ..	10	360·3	2	474·0	2	481·0	3	400·3	4	540·3	..	..	6	527·8	27	446·0	522·3
3. Haywood, Dr. A. R.	,, ..	1	266·7	3	405·7	4	392·7	3	451·4	2	584·2	1	422·9	17	514·3	31	475·5	516·5
4. Waterhouse, H. W. and Son	,, ..	9	321·2	2	329·0	4	404·8	2	463·9	3	520·3	1	474·8	8	437·0	29	400·9	472·1
5. Clarke, F. W. ...	,, ..	7	326·9	5	342·9	1	307·2	3	377·5	..	..	3	450·0	12	451·5	31	393·9	455·4
6. Bennett, J. W.	,, ..	18	328·1	5	305·1	8	346·1	4	352·4	2	452·6	3	429·9	7	420·1	47	356·3	450·6
7. Harvey, T. ..	,, ..	5	335·9	..	..	5	383·7	4	367·3	3	418·6	4	408·5	14	385·0	35	381·3	432·5
8. Bennett, R. H. and Sons	,, ..	9	314·2	4	338·8	3	305·8	1	279·0	2	378·5	..	..	11	412·3	30	355·7	425·2
9. McNabb, G. A. and Son	,, ..	14	271·6	..	..	7	333·1	3	338·0	2	551·0	3	381·0	23	395·0	52	355·4	423·1
10. Devon Park Stud Farm (G. S. Daley)	,, ..	12	296·3	1	383·5	4	389·4	1	414·3	1	353·0	1	376·9	8	376·1	28	344·6	421·8
11. Chester, E. N. ..	,, ..	4	249·5	4	335·8	..	..	5	375·2	3	390·0	4	432·6	8	387·5	28	364·9	420·7
12. Fairchild and Clutterbuck	,, ..	7	304·8	4	305·3	8	372·7	1	351·6	3	335·6	2	383·8	9	371·1	34	347·1	418·4
13. Hurrey, Estate of the late W. H.	,, ..	14	316·2	2	382·9	2	281·2	1	393·7	..	..	1	440·1	5	311·1	25	326·6	416·4
14. Colenso, L. W.	,, ..	7	233·2	1	358·6	..	..	..	..	1	387·2	1	311·3	16	428·0	26	366·8	410·8
15. Maher, R. H. ..	,, ..	8	267·3	1	317·1	8	311·4	2	399·0	5	333·4	2	306·6	24	393·0	50	349·1	407·8
16. Hore, E. ..	,, ..	7	269·2	6	309·4	2	286·3	2	357·1	4	338·9	2	370·0	13	368·6	36	331·0	394·8
17. Department of Agriculture	Red Poll	18	265·8	4	336·5	10	262·5	3	305·2	4	347·3	7	317·4	20	322·4	66	298·9	382·6
18. Atkinson, W. K.	Dairy Shorthorn	17	255·3	1	297·9	12	219·5	3	259·4	7	270·9	2	195·9	27	390·8	69	302·8	381·9
19. Axford, Estate of the late W. H.	Jersey ..	6	299·7	4	294·3	..	..	1	294·7	..	..	8	374·0	20	332·8	39	331·2	377·4
20. Ballarat Orphanage	,, ..	9	243·5	4	304·5	6	312·5	2	353·8	2	300·8	7	264·2	11	316·7	41	308·0	377·1
21. Butcher, F. T...	Red Poll	8	240·0	3	260·2	3	264·0	1	310·9	1	217·9	2	366·6	13	382·2	31	313·6	374·5
22. Hartley, C. G. ..	Jersey ..	5	242·6	1	264·1	..	..	2	423·9	3	313·7	2	346·1	14	355·2	27	330·8	373·1
23 Read, Estate of the late J. D	,, ..	10	259·8	..	..	2	281·9	2	306·9	3	324·0	..	..	9	342·0	26	301·0	368·0
24. Smith Bros. ..	,, ..	6	242·8	5	268·3	6	279·7	3	347·1	4	292·6	4	294·8	18	338·0	46	303·3	364·9
25. Crawford, Mrs. E	,, ..	10	265·2	3	297·2	4	279·5	3	295·3	4	235·6	1	271·5	3	357·5	28	279·8	364·2
26. McKenzie, Mrs. E J. and Sons	,, ..	7	289·9	1	252·2	3	268·2	1	203·8	2	391·6	2	260·3	9	313·7	25	296·7	356·1
HERDS OF 15 TO 24 COWS																		
1. Payne, A. E. T.	Guernsey	2	323·6	2	335·0	4	391·4	..	..	3	381·3	1	394·2	12	613·7	24	491·0	533·0
2. Jackson, H. ..	Jersey ..	5	336·2	4	419·8	..	..	2	502·4	2	472·1	1	611·1	4	547·3	18	450·2	519·5
3. Williams, L. ..	,, ..	7	346·2	..	..	2	480·9	1	403·5	2	507·2	..	..	3	498·5	15	419·9	495·9
4. Phillips, J. H...	,, ..	7	371·9	..	..	..	..	3	456·3	2	415·2	..	..	3	507·0	15	421·6	494·9
5. Till, J. A. ..	,, ..	10	356·6	2	419·4	..	..	..	..	2	440·0	1	432·0	6	463·4	21	404·6	479·1
6. Gardener Bros...	,, ..	3	293·8	2	310·6	4	413·4	3	443·3	1	483·3	..	..	9	448·0	22	409·2	462·7
7. Department of Agriculture	Friesian..	5	311·0	2	323·0	4	373·2	3	425·3	..	..	2	373·3	5	495·9	21	390·3	457·1
8. Wade, G. F. ..	Jersey ..	6	282·7	1	440·6	2	415·3	1	357·6	3	523·5	1	475·7	9	422·0	23	398·6	453·9
9. Handbury, J. E. and Son	,, ..	4	373·4	4	332·0	1	426·6	1	290·9	2	401·6	1	557·8	8	428·2	21	396·5	452·8
10. Charlton, G. F.	,, ..	3	358·9	3	355·5	..	..	1	402·1	..	..	1	449·6	8	431·4	16	402·9	449·6
11. Gay, W. C. R.	,, ..	6	350·5	..	..	1	483·7	..	..	1	492·2	1	318·9	7	415·0	16	393·9	448·2
12. Vaughan Bros...	,, ..	2	286·5	4	343·0	5	398·4	1	348·7	4	431·1	2	375·7	4	407·6	22	381·4	444·0
13. Desmond, J. J.	,, ..	8	334·0	..	..	3	426·9	1	282·4	..	..	..	..	7	413·3	19	375·2	443·5
14. Wilson, Alan ..	,, ..	3	334·9	..	..	..	..	..	..	..	..	1	516·3	12	430·8	16	418·2	442·4
15. Nicholas, M. A.	,, ..	4	310·4	2	301·6	..	..	2	351·2	1	399·7	..	..	9	421·2	18	374·3	422·4
16. Bruhn, C. H. ..	,, ..	5	335·7	1	349·6	1	514·9	2	421·6	3	359·1	1	472·3	4	290·5	17	358·7	420·9
17. Jakobi, L. W. ..	,, ..	4	335·2	5	297·4	2	271·6	2	452·0	..	..	2	351·3	6	405·5	21	353·1	418·0
18. Stephens, Dr.F.P.	Guernsey	1	321·7	..	..	2	390·1	4	337·0	2	307·9	1	448·0	5	422·3	15	375·0	416·3
19. Tomasetti, B. G.	Ayrshire	3	288·4	2	323·5	3	300·9	1	289·8	3	463·5	2	463·6	7	372·0	21	363·2	414·8
20. Clark, P.W. & Son	Jersey ..	5	296·3	..	..	2	362·4	2	318·6	5	443·3	1	394·7	9	364·7	24	364·0	414·4
21. Keele, H. A. ..	,, ..	6	277·4	1	354·7	5	352·4	..	..	3	424·2	1	365·9	5	361·6	21	344·1	411·9
22. Hardie, R. B. ..	,, ..	4	253·0	1	393·0	2	416·8	3	385·1	2	312·1	..	..	12	372·9	24	353·8	399·9
23. Meaklim Bros. ..	Dairy Shorthorn	1	313·2	..	..	2	329·9	3	322·6	2	368·5	..	..	8	383·4	16	350·1	393·3
24. Parkes, E. Fraser	Jersey ..	3	267·3	5	245·4	..	..	3	337·7	1	305·9	..	..	3	489·1	15	321·0	393·0
25. Broad, Mrs. A. A.	,, ..	6	312·6	2	302·7	3	302·0	1	341·7	2	317·8	1	350·8	7	358·4	22	328·4	391·9
26. Cowan, G. L. S.	Friesian..	3	213·4	2	249·4	2	316·9	3	332·2	2	329·0	1	341·7	9	417·0	22	341·9	390·9
27. Trevaskis, F. T.	Jersey ..	3	303·3	3	257·7	2	279·2	2	285·1	2	426·2	1	259·4	2	378·9	15	312·1	381·4
28. Broad, A. J. ..	,, ..	3	262·7	..	..	4	314·7	4	345·6	..	..	1	360·6	8	347·9	20	328·7	378·2
29. Chadderton, J. E.	,, ..	3	260·0	2	308·8	1	337·2	1	359·7	1	285·1	3	356·1	5	354·8	16	326·3	376·8
30. Emmett, Mrs. S. and Sons	,, ..	5	278·3	2	335·2	..	..	1	415·7	1	343·1	4	345·9	10	336·8	23	329·2	375·8
31. St.Joseph's Home	,, ..	6	246·9	..	..	1	321·9	..	..	3	295·3	1	425·5	5	322·2	16	295·4	354·6
32. Hore, M. T. ..	Friesian..	2	248·1	3	253·2	5	226·8	2	324·8	2	234·9	1	438·2	8	365·7	23	298·8	353·2
33. Ross, D. M. ..	Dairy Shorthorn	3	271·3	..	..	1	256·3	..	..	2	291·7	5	335·0	13	335·1	24	320·2	350·5

HERD AVERAGES 1945-46 (*continued*).

Owner.	Breed.	Junior 2-year-old.		Senior 2-year-old.		Junior 3-year-old.		Senior 3-year-old.		Junior 4-year-old.		Senior 4-year-old.		Mature.		Total Herd.	Average Butter-fat without Allowances.	Average Butter-fat with Allowances.
		No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.	Average Butter-fat.	No.		
			lb.		lb.		lb.		lb.		lb.		lb.		lb.		lb.	lb.
HERDS OF 10 TO 14 COWS																		
1. Ronalds, O. and Son	Jersey ..	2	371·6	2	448·8	1	486·2	..	..	..	..	2	483·9	5	530·6	12	479·0	525·6
2. Masters, S. H. and Son	,, ..	2	415·4	3	443·1	1	411·8	1	524·0	..	..	1	503·2	6	482·1	14	463·7	513·7
3. Cox, R. ..	,, ..	1	365·3	3	405·4	1	438·3	1	583·8	3	453·9	..	..	1	329·2	10	429·4	497·4
4. Lind, A. E. and Sons	,, ..	6	351·7	1	364·3	2	374·3	2	484·3	1	359·2	1	493·8	1	445·5	14	392·2	475·0
5. McKenzie, A. E.	,, ..	4	320·1	..	..	..	..	1	579·1	4	374·9	1	486·5	2	501·3	12	404·0	464·0
6. Prince, Mrs. H. A.	,, ..	4	284·5	2	449·0	..	..	1	423·5	..	..	1	573·9	4	433·3	12	397·2	460·6
7. Nancarrow Bros.	,, ..	6	329·7	1	347·5	..	..	1	206·7	..	..	..	..	5	508·3	13	390·3	458·0
8. Fixter, A. ..	Guernsey	4	344·6	..	..	1	493·5	1	427·4	1	380·2	1	334·4	4	436·5	12	396·7	453·3
9. Broad, W. A...	Jersey ..	..	..	1	441·6	1	549·8	1	428·4	2	503·9	2	347·7	5	383·6	12	420·1	450·1
10. Walker, C. S. ..	,, ..	1	345·3	1	380·0	..	..	2	431·6	..	..	1	396·5	6	432·8	11	416·5	449·2
11. Dunmore, T. J.	,, ..	3	272·4	..	..	2	365·6	1	424·8	2	428·3	2	424·6	1	556·4	11	385·0	448·6
12. Shearman, A. and W.	,, ..	2	321·3	1	327·0	1	369·6	..	..	3	440·1	..	..	5	417·1	12	395·4	440·4
13. O'Neill, J. ..	,, ..	1	316·3	..	..	2	358·5	1	518·5	2	418·0	1	443·7	5	397·4	12	401·5	438·2
14. Mitchell, R. H.	,, ..	1	373·1	..	..	..	..	2	424·7	1	416·6	1	514·5	5	375·9	10	403·3	433·3
15. Barker, Mrs. E. M., Richardson, G. H., and Hornsby, F. C.	,, ..	5	345·3	..	..	1	335·3	2	428·5	1	408·6	1	283·5	2	348·2	12	359·0	430·6
16. Carne, W. J. ..	,, ..	2	353·1	2	304·9	..	..	..	..	1	401·5	..	..	5	420·0	10	381·8	429·8
17. Trewin, J. V. ..	,, ..	3	290·8	3	364·2	1	363·0	..	..	..	..	..	..	3	393·8	10	350·9	424·9
18. Williams, Estate of the late F. A.	,, ..	4	263·1	1	267·0	..	..	..	..	..	..	2	470·3	3	452·2	10	361·7	423·7
19. Grice, C. S. ..	,, ..	4	320·0	3	323·9	1	272·1	1	436·5	1	518·6	..	..	2	318·0	12	342·9	422·9
20. Simmons Bros...	,, ..	4	307·3	1	329·1	2	362·2	..	..	1	469·9	..	..	4	377·1	12	355·1	420·1
21. Peck, R. A. ..	,, ..	4	294·9	1	252·1	1	435·4	1	233·2	1	373·6	..	..	5	442·6	13	360·5	419·0
22. Powell, Mrs. K. E.	,, ..	6	288·4	..	..	2	318·3	2	440·0	1	353·0	1	265·0	1	403·7	13	328·4	409·9
23. Jardine, W. R.	,, ..	4	320·2	2	288·5	1	478·0	2	233·9	..	..	1	380·0	4	395·5	14	340·4	404·7
24. Broad, E. E. ..	,, ..	4	343·1	1	292·9	1	321·0	2	357·9	..	..	1	239·8	5	337·7	14	330·7	387·9
25. Doyle, Dr. G. ..	,, ..	1	337·0	3	274·4	1	366·5	4	322·1	2	307·4	..	..	2	340·5	13	316·2	370·3
26. Harris, J. W. and Son	,, ..	3	250·6	2	361·9	1	319·2	..	..	..	..	1	363·6	3	319·0	10	312·3	378·0
27. Black, Estate of the late I. S.	Ayrshire ..	..	..	1	296·6	2	350·9	1	387·4	3	307·9	1	364·5	3	331·2	11	333·4	375·3

THE PRESERVATION OF EGGS

For home use a supply of eggs can be carried over from late spring or early summer until the following autumn and winter months. For best results the eggs should be taken clean from the nest, and treated with a reliable well-tried preservative.

Whatever preservative is used, directions should be followed carefully and the eggs should be stored in a cool place. If a preservative solution is used, the preparation should be quite cold beforehand. Completely immerse the eggs and do not take them out of the solution until they are required for use.

The testing of eggs for quality is done by candling—the examination of the egg shell and its contents in front of a strong ray of light. The quality of the egg is assessed when it is held before the light, and the method is extremely accurate when performed by experts. Householders could easily make a simple candling device by enclosing an electric globe in a suitable cardboard box of small size, with a hole in front somewhat smaller than an egg. In a darkened room the egg is placed against the hole.

The size of air-space can be seen at the large end of the egg, and when the egg is new-laid this air-space is approximately the size of a threepenny piece. The yolk of a fresh egg is held in the centre of the egg, and on candling appears translucent or is barely visible. When the egg is stale, the yolk is apt to fall within the egg. The chief points to be noted when candling are, texture and the thickness of shell, size of air-space, condition of yolk, condition of white and presence of internal blemishes, such as blood spots, &c.

Eggs intended for preservation should not be placed in water and washed.

(H. F. CLINTON, Poultry Expert.)

Stud Plots

Each year a number of plants considered to be desirable parents are mated at the State Research Farm, Werribee, the progeny being grown and studied in the nursery rows of the stud cereal section at Walpeup. These rows are subjected to drastic culling by the plant breeder, and only those plants exhibiting desirable characters are retained for further selection and testing.

A special milling test (Pelshenke Test) enables the lines of low flour quality to be eliminated, and a special section is sown to test the resistance of new crossbreds to flag smut. The selection work is continued for a number of years until only a few of the more promising true breeding strains of the original population are left. These are then grown in seed multiplication plots and finally pass to the larger field plots for accurate testing to determine their yielding capacity.

Wheat Manurial Trials

During the years 1933–40, trials with wheat on fallow were sown to test several rates of application of superphosphate per acre at each of three times of sowing (*a*) early, April; (*b*) mid-season, May; and (*c*) late, June. A different site for the tests was chosen each year, the crop before the fallow being a stubble crop of oats sown with a light dressing of superphosphate. The results of these trials are set out in Table 5, and the marked response to superphosphate at each sowing is evident.

It will be seen by an examination of the following table that an increase in the yield of wheat was obtained with each addition in the amount of superphosphate applied at each time of sowing. Moreover, and contrary to a generally accepted idea, the tests over eight years indicate that early-sown crops require superphosphate to as great an extent as do those sown later. An equally good response is obtained to the application of superphosphate at an early sowing as at a later sowing.

TABLE 5.—WHEAT MANURIAL TRIALS (replicated).

(Average 8 years, 1933 to 1940—Yields in bushels per acre.)

Treatment.	Sown Early.	Sown Mid-season.	Sown Late.	Average of Three Times of Sowing.
No manure ..	22·2	21·8	16·6	20·2
Superphosphate—				
30 lb./ac. ..	25·1	24·1	19·3	22·8
60 lb./ac. ..	27·2	25·4	20·6	24·4
90 lb./ac. ..	28·3	26·2	21·5	25·3
120 lb./ac. ..	29·2	27·0	22·2	26·2
Average yield ..	26·4	24·9	20·0	23·8

During the years 1936–40, dressings of 150 lb. per acre were included in the test to determine if a further increase in yield was obtainable. The application of 150 lb. of superphosphate per acre did not materially alter the yield from that obtained with 120 lb. per acre.

In 1940, manurial trials were established on permanent sites, to obtain information on the long term effects of superphosphate applications. The rotation of these three permanent sites is wheat–oats–fallow, no superphosphate being sown with the oats. The results obtained to date are shown in

Stud Rows of Wheat and Oats.

Table 6, but the experiment has not been established long enough for the determination of trends in yields.

TABLE 6.—PERMANENT MANURIAL TRIALS.
(Average results 6 years, 1940-45—Yields in bushels per acre.)

Treatment.	Average Yield.
No manure	12·7
Superphosphate—	
30 lb./ac.	14·6
60 lb./ac.	15·5
90 lb./ac.	16·2
120 lb./ac.	16·3

Economic Use of Superphosphate

The results of mid-season sowings of manurial trials for 21 years are shown in Table 7. This table shows the increased returns which may be expected from various applications of superphosphate. To counterbalance the effect of the outside row, the plot yields as obtained, have been reduced by 12½ per cent.—an amount by which it has been found yields are increased in plots of this size due to the outside row effect. Wheat has been valued at 4s. 3d. at country sidings, and superphosphate at £6 per ton on the farm.

TABLE 7.—WHEAT MANURIAL TRIALS.
(Average of 21 years—Mid-season sowings.)

Treatment.	Average Yield (Twenty one Years).	Increase Due to Superphosphate.	Value of Increase at 4s. 3d. Bushel.	Cost of Superphosphate at £6 per Ton.	Extra Return Due to Superphosphate.
			s. d.	s. d.	s. d.
No manure ..	15·1	..	..	..	..
Superphosphate					
30 lb./ac. ..	17·4	2·3	9 9	1 7	8 2
60 lb./ac. ..	18·4	3·3	14 0	3 2	10 10
90 lb./ac. ..	19·2	4·1	17 5	4 9	12 8
120 lb./ac. ..	19·4	4·3	18 3	6 4	11 11

From these figures, it appears that under conditions similar to those at Walpeup, the most profitable dressing for wheat on fallow is about 90 lb. per acre, when wheat on the farm is valued at 4s. 3d. per bushel.

It will also be seen that the greatest extra return has been given by the application of the first 30 lb. per acre, and that each successive 30 lb. increase gives a lower extra return. Therefore, when manure is in short supply, it is better to sow all the crop with some manure—whatever amount can be obtained—than to sow some at say 90 lb. per acre and the remainder without manure.

Wheat manurial trials are conducted on farmers' properties where country plots have been established. The results in the southern part of the Mallee tell the same story as at Walpeup. At these centres during the past few seasons, yields have been low and thus increases due to superphosphate are not great, but it appears that for the southern Mallee, a dressing of approximately 90 lb. per acre gives the highest net return.

In the Millewa at Werrimull, the experiment was designed to provide information as to the response obtained from superphosphate both on the "flats" and "sandy rises". Over the period of the test, the sandy rises have shown a greater response to superphosphate than have the flats. This feature, however, has not been consistent in each year—in years of good rainfall better responses are obtained on the flats. Results given are for the averages of the flats and rises. These results show that there has been a lesser response to superphosphate in the Millewa, and a dressing of 30 lb. per acre is recommended for that area.

TABLE 8.—WHEAT MANURIAL TRIALS AT MALLEE CENTRES.
(Average yields in bushels per acre.)

Treatment.	Woomelang (Six Years 1940–45).	Ultima (Five Years 1940–1-43–5)	Swan Hill (Seven Years 1933–39).	Rainbow (Ten Years 1927–36).	Werrimull (Ten Years 1932–41).
No manure ..	10.6	5.8	18.3	14.1	15.2
Superphosphate—					
30 lb./ac. ..	11·4	6·4	20·3	..	16·0
60 lb./ac. ..	12·0	6·6	20·8	15·3	16·2
90 lb./ac. ..	12·1	7·1	21·7	..	16·8
120 lb./ac. ..	12·2	7·2	21·6	17·1	17·3

In addition to the manurial trials on fallow land, tests with superphosphate were conducted on stubble land at Walpeup for the years 1937–40. These results confirmed the information obtained from the Oat

Manurial Trial on stubble and showed that when the previous crop was adequately manured, the crop does not respond to heavy dressings of superphosphate. Applications of approximately 30 lb. per acre appear to be all that is warranted.

TABLE 9.—WHEAT MANURIAL TRIAL, STUBBLE GROUND.

(Average of 4 years, 1937–40.)

Treatment.	Yield.
	bus./ac.
No manure	9·7
Superphosphate—	
30 lb. per acre	10·4
60 lb. per acre	10·6
90 lb. per acre	10·6

Minor Element Manurial Trial

Recent emphasis on the fact that optimum plant growth is produced only where there is present in the soil, in addition to the more commonly recognized essentials, small amounts of certain minerals other than phosphate, nitrate or potash, has greatly widened the scope of manurial trials. These minor elements are needed only in small amounts, and because of that, they are usually present in sufficient quantities in most soils. Responses to minor elements have usually been limited to certain soil types, or where regular cropping may have caused mineral depletion.

Recent work has shown that there are a number of areas in Australia where responses have been obtained to one or another of these minor elements—the response in wheat to applications of zinc sulphate in the Wimmera being one such case.

To investigate the question, a "minor element" manurial trial was commenced in 1938. A series of plots was sown on fallow land with a basal dressing of 90 lb. of superphosphate per acre, and in addition, requisite amounts of various minerals were added when certain plots were sown. The experiment was repeated in 1939 with slight modifications in the rate of application of some of the minerals, and similar treatments were given in an oaten-hay trial. In 1940, the trial was located on a limey patch of ground, but was confined to rows. The minerals added to the superphosphate, together with the rates per acre at which they were applied were as follows:—

Zinc sulphate 20 lb. per acre, magnesium sulphate 56 lb./ac., borax 5 lb./ac., copper sulphate 15 lb./ac., iron sulphate 56 lb./ac., manganese sulphate 30 lb./ac., and potassium sulphate 90 lb./ac.

These trials, during the three years, showed that there was no significant improvement in yield due to the addition of these minerals, and the trial was discontinued. It is pointed out that care should be exercised in the use of some minor elements as their indiscriminate application may prove detrimental both to the crop (e.g., due to low germination), or to the soil to which they are applied.

In 1939 and 1940, strips in a crop on a limestone area at Underbool were top-dressed with the same range of minor elements as were used at Walpeup, but here again, no significant increase in yield was obtained.

Time of Sowing

In the Mallee, experience has proved that highest yields are usually obtained by sowing early, provided that the land is reasonably free from weeds. In seasons with a dry spring, late-sown crops seldom yield equal to those sown early, but in some years, late spring rains benefit late sown crops to a greater degree than those sown early.

In addition to the "time of sowing trial", the results of which are given in Table 10, other trials, which include the time of sowing factor (Tables 5, 11, and 12), all demonstrate the higher yields obtained from early sowing at Walpeup.

TABLE 10.—TIME OF SOWING TRIAL.

(Average results of 10 years, 1932–41. Variety Ranee 4H.)

Time of Sowing.	Average Yield.
	bus./ac.
Early (3rd week in April)	28·8
Mid-season (mid-May)	26·4
Late (2nd week in June)	22·8

During the period 1937–41, the time of sowing trial included three varieties sown at twelve-day intervals throughout the seeding period. The varieties were Ranee 4H (early maturing), Ghurka (mid-season), and Sepoy (late maturing). Results from this trial again confirmed the superiority of early sowing, and also showed the importance of the incidence of the spring rainfall in relation to the time of heading and flowering of wheat in determining the yield of the crop.

Early sown crops germinate more readily while the ground is still warm, and make quick growth in the more favorable growing conditions. This is of particular importance on the sandier areas, as by covering the ground more quickly the early sown crop is better able to withstand sand blasting than a later sown crop.

The weed problem is a factor which plays a big part in determining the time of sowing. Dry sowing does not allow for a kill of mustard or wild turnip, and a crop sown under such conditions may suffer serious competition from these weeds, particularly during a dry spell in the spring.

Wild turnip growth can be particularly vigorous, and unless a kill is obtained, serious inconvenience may be experienced at harvest. Therefore, one is compelled to wait for a rain to get a kill of the seedlings of this weed. Another factor that delays sowing is the presence of hard wind-blown patches which cannot be broken up until after rain. Experience suggests that, in those years when little autumn rain falls, it may be advisable to delay sowing until after the break (depending on the particular conditions on the farm); but when an autumn break is received, sowings in the Mallee should be commenced as early as possible after the middle of April.

Rate of Seeding Trials

Variations in the rate of seeding of a wheat crop for grain has resulted in only small differences in the final yield. During the period 1933–37, a rate of seeding trial designed to compare various seeding rates between half a bushel and one and a quarter bushels per acre was conducted. As in other major trials, the plots were sown at the three periods—early, mid-season, and late. The average results of the trial are shown in Table 11. During these years, variation in rate of seeding at each time of sowing did not have any marked effect on the yields obtained. These tests, however, were conducted on land comparatively free from weed growth.

TABLE 11.—RATE OF SEEDING TRIAL.
(Average 5 years, 1933–37.)

Rate of Seeding.	Early.	Mid-season.	Late.
	bus./ac.	bus./ac.	bus./ac.
30 lb. wheat per acre ..	30·6	26·0	26·0
45 lb. wheat per acre ..	31·7	25·8	26·2
60 lb. wheat per acre ..	31·4	25·8	25·6
75 lb. wheat per acre ..	31·3	25·1	25·6

During the first four years of this test, the variety sown was Ranee 4H, while Ghurka was used in 1937. It is generally accepted that as seeding progresses, the seeding rate should be increased, but the above results indicate that there is little to be gained by sowing more than 45 lb. per acre on relatively clean land under Mallee conditions.

This was again confirmed in 1939 and 1940, when the trial included three varieties of wheat (Ranee 4H, Ghurka, and Regalia), each sown at 20, 40, and 60 lb. of seed per acre, and at three times of sowing, Table 12 shows the average yields obtained from the three varieties.

TABLE 12.—RATE AND TIME OF SOWING TRIAL.
(Average yield, three varieties, 1939–40.)

Treatment.	Sown Early.	Sown Mid-season.	Sown Late.
	bus./ac.	bus./ac.	bus./ac.
Seed 20 lb. per acre ..	22·6	18·4	12·8
Seed 40 lb. per acre ..	23·0	18·5	13·7
Seed 60 lb. per acre ..	22·6	18·3	13·0

Although the optimum seeding rates may be governed to some extent by the variety of wheat grown, none of the varieties included in the above trial has shown any significant variation in yield due to rate of seeding within the limits of 20 lb. to 60 lb. per acre.

TABLE 13.—RATE OF SEEDING TRIAL. SOWN MID-SEASON.

(Average three years, 1938–40. Bushels per acre.)

Rate of Seeding.	Regalia.	Ranee 4H.	Ghurka.
	bus./ac.	bus./ac.	bus./ac.
Seed 20 lb. per acre ..	21·3	19·7	19·1
Seed 40 lb. per acre ..	21·4	20·0	19·2
Seed 60 lb. per acre ..	21·6	19·9	18·0

During these three years, experiments indicated that the response to superphosphate was not significantly affected by the rate of seeding of the crop.

Heavier sowing may be justified on land liable to drift severely, or where competition from weeds is to be expected, that is, in cases where it is desired to get a good ground cover as quickly as possible.

WHEAT DISEASES

Flag smut (*Urocystis tritici*).—Wheat varieties differ in their degree of susceptibility to flag smut, and the best means of controlling this disease lies in the use of varieties which are resistant. Losses have been greatly reduced in recent years by the widespread sowing of the resistant varieties Ghurka, Pindar, and Bencubbin.

Infection of the young growing plant takes place from spores or seeds of the disease present in the soil and to a lesser extent, from seed borne spores. For this reason, it is impossible to control the disease by pickling the seed. Experimental work in 1932 and 1933 showed that yields of susceptible varieties could be reduced by 75 per cent. through a heavy infection of flag smut.

Results of flag smut investigations have shown that the burning of infected stubbles, fallowing, the rotation of crops, and adequate manuring with superphosphate all tend to reduce the losses caused by the disease on susceptible varieties. Grazing off a young crop increases the severity of the disease, while early sown crops are more liable to serious infection, as the soil and temperature conditions are then more favorable for the germination of the spores. If sowing is delayed, most of the spores will germinate before the crop is sown and in the absence of a host plant to infect, the germinated spores will die.

The experiments have also shown that infection of a susceptible variety of wheat is governed to a large extent by the balance of minerals in the soil. A deficiency or an excess of calcium (lime) within the plant results in a reduction of the development of the disease, while a phosphorus deficiency increases the degree of infection. Applications of superphosphate and of ammonium sulphate each assists in reducing the incidence of the disease. The former manure increases the amount of phosphoric acid available to the plant, while the latter has an indirect action on the absorption of calcium. The calcium (lime) content of most Mallee soils is at a level favorable to the development of flag smut and this, coupled with the fact that these soils are naturally low in phosphates, is probably one of the reasons why crops of susceptible varieties show a greater infestation with flag smut in the Mallee than in most other parts of the State.

Inheritance of Resistance to Flag Smut in Wheat.
Row 1—Resistant; Rows 2 and 3—Susceptible to disease.
The three selections are the progeny of a mating between Nabawa (resistant) and Indian H (susceptible).

Degree of Resistance to Flag Smut

The most important means of control is by the use of resistant varieties. The following table indicates the degree of resistance to flag smut possessed by the commoner wheat varieties :—

Very susceptible—	
Baldmin	Free Gallipoli
Federation	Magnet
Regalia	Mogul
Susceptible—	
Rance 4H	Rajah
Bobin	Sepoy
Moderately resistant—	
Gular	Currawa
Ford	Joffre
Resistant—	
Insignia	Javelin
Ghurka	Pinnacle
Quadrat	Bencubbin
Pindar	Koorda
Nabawa	Warigo.

All new crossbred wheats sown in all yield trials in the State are tested for flag smut resistance at Walpeup. In this way, the reaction of a new variety to the disease has been ascertained before it is released to farmers. All the wheat varieties released by the Department since 1940 are resistant to the disease.

Ball smut, stinking smut, or Bunt (*Tilletia tritici or T. levis*). Ball smut was for many years the most troublesome and destructive disease of wheat in Victoria. The development of pickling techniques, first the wet pickling with bluestone or formalin and later the dry pickling with copper or mercury compounds have proved a satisfactory control, provided the pickling is done thoroughly.

At this station, the trials with ball smut have been concerned with the efficacy of various dry pickling powders in preventing ball smut, and also to determine the effect of the more common pickling powders on the germination and yield of wheat when clean seed is pickled. In regard to the latter aspect, the results have failed to show any significant differences in yield due to the pickling treatment.

In the trial designed to compare the effectiveness of the various brands and types of dry pickling compounds in controlling ball smut, various copper and mercury compounds marketed under proprietary trade names have been investigated. The method of testing was to sow small drill plots, the seed of each plot having been artificially infected with ball smut spores before pickling. Counts of the infected plants were made before harvest, in order to determine the percentage of disease in the crop. The trial indicated that most of the copper compounds now on the market are stisfactory in controlling bunt. There are substantial differences between some of the mercury compounds, but the better brands are more effective than the copper fungicides. Seed pickled with a mercury compound runs more freely in the drill, but a certain amount of care is necessary when using it as it is very poisonous and can cause nasty sores on the hands. The fact that a smaller amount per bushel is required offsets to some extent the higher cost of the compound.

The most important factor in using any dry pickling compound is to ensure that the pickle is thoroughly dusted on the seed, so that every seed gets a coating of the pickle. From 1½ to 2 oz. of pickle per bushel of seed is necessary. There is often a tendency to try to do the pickling too quickly, with the result that all grains are not thoroughly dusted—and in these cases, such grains are not protected against the disease.

Loose smut (*Ustilago tritici*).—In this disease, the seed head of the wheat plant at flowering time is replaced by a loose black mass of spores. When these spores blow away—to infect other plants—only the bare "back-bone" of the head is left. The control of loose smut is much more difficult than ball smut, because the spores of the disease enter at flowering time and are enclosed within the grain, and therefore cannot be reached by pickling powders.

A method of control is to use a hot water treatment to kill the spores within the grain, but the temperatures must be regulated so that the wheat grain is not affected. Modifications of this treatment, using the heat of the sun, have proved satisfactory when high temperatures are experienced. Four hours soaking in water in a tray in the sun, when the temperature exceeds 100° F., then drying the soaked wheat has proved a satisfactory control. Thus the seed being dried out in the treatment, presents no difficulties at seeding time.

Efforts are also being made by cross-breeding to procure varieties that are resistant to the disease. The most practicable precaution farmers can take is to obtain their seed from crops as free as possible from the disease.

Root Diseases of Cereals

Various organisms causing root rot in cereals have been recorded at the Mallee Research Station. The number of species that causes these diseases makes experimental work on their control particularly complex—as several species may be present in the one plant.

The following are some of the organisms which have been identified at this station :—

WHEAT—*Ophiobolus graminis* (take-all), *Fusarium culmorum*, *Helminthosporium* spp, *Curvularia ramosa*, *Wojnowicia graminis*.

OATS—*Curvularia ramosa*, *Rhizoctonia solani* (purple patch), *Fusarium* spp., *Stemphylium lanuginosum*.

BARLEY—*Helminthosporium* spp., *Fusarium* spp., *Curvularia* spp.

Observations made at this station suggest that these diseases are more destructive where the soil preparation is least efficient, e.g., in 1945, worst infection occurred in non-fallow, a lighter infection was present in late fallows and fallows which were sheeped only, while practically none was apparent in well-cultivated fallows. The "no manure" plots of the Manurial Trial also showed a greater degree of infection than the plots which received superphosphate.

Experimental work at other places shows that crops are more susceptible to these diseases when the soil is over-cropped or fertility is depleted.

The concluding instalment of this article will appear in a subsequent issue of the Journal.

Improved Swabs for Vaccinating against Infectious Laryngotracheitis

Poultry owners who have vaccinated their birds in previous years against infectious laryngotracheitis are advised that an improved type of swab is now available from the Commonwealth Serum Laboratories, Parkville, and should be ordered with the vaccine. One swab is used for each bird and must then be dropped into a discard box which can be burned at the end of the day's operations. Under no circumstances should the swabs be thrown about the pens or runs, as the vaccine being used is a live one and every precaution should be taken in its use.

Before the vaccine can be obtained from the Commonwealth Serum Laboratories, a permit must be secured from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2. The property on which vaccination is being carried out will be quarantined—this precaution is necessary to prevent the disposal of birds recently vaccinated. Removal of birds from such properties cannot be permitted until a period of three weeks has elapsed after vaccination, or in the case of a natural outbreak of the disease, until three weeks after the trouble in the flock has abated.

The vaccine used for the control of infectious laryngotracheitis is suitable for this disease only and will not protect against any of the other respiratory infections of poultry. Where trouble is experienced in a flock, a live sick bird should be submitted to the Director, Veterinary Research Institute, Parkville, in order that a correct diagnosis may be established and advice given on the control of the particular disease.

[Contributed by the Live Stock Division.]

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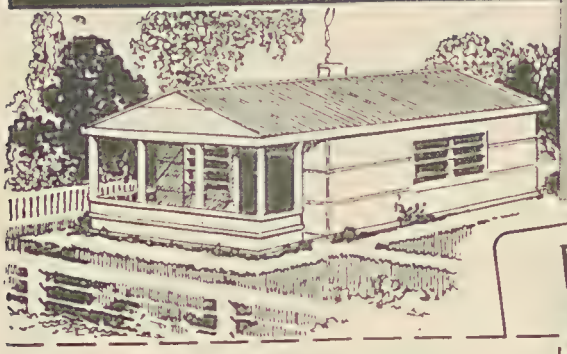

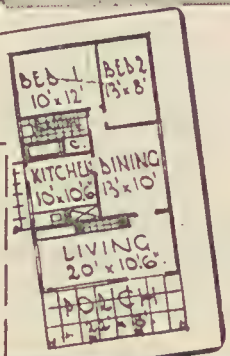

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Establishment, Maintenance and Renovation of Lawns and Playgrounds

By F. R. DRAKE, B.Agr.Sc., *District Agricultural Officer*

AS the lawn is intended to be a permanent feature of a garden, thorough preparation of the ground before sowing or planting is most important. No deficiencies in the manner of preparing the ground before planting can be remedied subsequently without great inconvenience and heavy expense. Of the many causes of failure or poor results, the following are the most important:—1. Poor soil preparation. 2. Sowing at an unfavorable time of the year. 3. Sowing grasses which are not true turf-forming plants. 4. Sowing seed of poor quality—that is, of low germination or containing many weed seeds. 5. Incorrect manurial treatment.

Preparing the Ground

In considering the preparation of an area of ground which is to be planted with lawn, one must take into account the nature of the soil, the amount of levelling to be done, and the weed population present. As regards soil, one is usually restricted to the soil naturally occurring. From the points of view of cost of preparing the ground, and ease of planting and maintenance of the established lawn, sandy soils are the most desirable. A satisfactory garden lawn can be established, however, on almost any type of soil, provided it is topsoil and not subsoil, and provided it is correctly prepared for sowing. On very heavy soils the incorporation of some sandy soil is desirable, but the bringing-in of any large quantity of outside soil adds greatly to the expense of the undertaking. For areas that are to be used for playing, such as golf and bowling greens, the use of a lighter soil is essential, to maintain a clean, dry and firm playing surface.

In preparing the ground for a lawn, deep cultivation of the soil before seeding is not necessary. What is essential, however, is very thorough cultivation of the top 4 to 6 inches of soil to produce a very fine tilth. If the ground is infested with creeping weeds it must be dug over to at least the depth to which the runners penetrate, and all runners cleaned out. After the first digging, the ground should not again be disturbed deeply, but allowed to settle and consolidate. The surface few inches should be cultivated regularly to destroy weeds as they germinate and to prepare a very finely divided surface soil in which to sow the seed.

If the area requires more levelling than can be done by filling with topsoil, it will be necessary to remove the topsoil altogether, adjust the levels by moving the subsoil, and then replace the topsoil. Unless this is done, portion of the lawn will be sown on the subsoil exposed during levelling, and such parts will always be unsatisfactory and specially liable to burn out during the summer.

Having levelled the area and cleaned out all the runners of creeping weeds, one should not be in too great a hurry to sow the seed. The longer the area can be fallowed, the more weed seeds will be germinated and killed by cultivation. Also time is necessary to allow the ground to settle properly, to make final adjustments in the levels and to prepare a really fine seed bed. More time is required to get a heavy soil into satisfactory condition for sowing than is needed for a sandy soil.

Sowing the Seed

We have seen that the ground to be sown should be reduced to a very fine tilth. Most lawn seeds are very small and could not be expected to succeed if sown on a rough, cloddy seed bed. Further, this very small seed will not germinate if buried too deeply. The usual method is to broadcast the seed on the surface by hand, and cover by means of a very light raking. The seeding rate is usually about 1 oz. to the square yard, and in order to facilitate even spreading, the seed is best bulked up with a quantity of dry sand or, if obtainable, sawdust. The mixture of sand or sawdust and seed should be divided into two equal parts and the area gone over twice, in different directions.

The time of sowing is not always under the control of the person doing the job, but where possible lawns should be sown in the early autumn, with early spring as second choice. Winter sowings are slow to establish, and at this time of the year weeds are likely to grow much faster than the grass.

Choice of Grasses

Ornamental lawns and areas of turf used for sport are often very different, not only as regards their botanical composition, but in the methods required for their successful maintenance. It is proposed to deal with each of the more important grasses in turn, and to discuss its suitability or otherwise for each purpose.

To most people an area of turf is either buffalo, couch, or "English grass," the last term being used vaguely to cover any miscellaneous collection of grasses and clovers other than the first two. *Buffalo*, at one time the standard lawn grass around Melbourne, is rapidly losing popularity. As a lawn grass it has quite a lot to recommend it, being vigorous and drought resistant and making a dense and attractive summer lawn. However, it provides a nice lawn during the summer only and is brown and dormant during the winter. With increasing age, buffalo tends to become very spongy, especially on banks, and therefore difficult to mow. Buffalo does not stand really hard wear, and this fact coupled with its tendency to become spongy, rules it out as a grass for playing fields of any kind. It does best in sandy soils and in coastal districts, where frosts are less severe than they are inland.

Couch grass, on the other hand, is a grass which has maintained its popularity and will almost certainly continue to hold an important place, particularly for recreational areas. In one way it resembles buffalo—in being a summer grower, with a completely dormant phase during the winter. It is even more drought-resistant than buffalo, is extremely hard wearing, and makes a fine-leaved, close, and firm turf which is infinitely superior, for sporting purposes, to that formed by buffalo. Considered as a lawn grass, couch is losing favour around Melbourne because of its poor winter appearance, but for the harder and drier conditions inland it maintains its supremacy.

For certain classes of sports turf, the good qualities of couch grass outweigh its shortcomings, and for heavy duty work in the sporting field it is unsurpassed. Its special uses are for tennis courts and golf fairways and for large-scale lawns where water is limited. Couch grass is so completely dormant in the winter that various volunteer annual plants are able to grow through it, thus preserving the colour of the turf and making it attractive

A wide stretch of well-kept lawn on a metropolitan golf links.

to play on at that time. The growth of these winter grasses is of special importance on golf fairways, and here the common *Poa annua* or winter grass is the most useful.

The so called "English grasses" are, of course, many and varied, and include perennial rye-grass, crested dogstail, Kentucky blue grass, Chewing's fescue (and other fescues), and the various bents such as brown top, red top, and the creeping or stoloniferous bents. *Poa annua*, mentioned as a common volunteer in couch lawns, is often present in large amounts in lawns of the English grass type.

The commonest ingredient of most lawn mixtures is *perennial rye-grass*. Rye-grass is a strong-growing plant with shiny leaves of medium width and is a tough grass to mow. It forms a fairly good, hard-wearing turf of good colour on fertile soils, but is not a turf forming grass in the true sense of the word in that it will not stand constant, keen mowing for any length of time. If grown as single plants, rye-grass becomes tufted and shows no tendency to creep. To obtain a turf of any density and to avoid tuftiness a heavy sowing of seed is necessary. Perennial rye-grass may therefore be regarded as definitely a second rate lawn grass, suitable particularly for large scale work where the quality of the turf must take second place to considerations of cost of establishment and maintenance.

Unquestionably the most attractive type of lawn is one consisting solely of grasses, but on large areas the maintenance of a pure grass sward entails considerable expense and constant vigilance and treatment. Under such conditions a mixed sward of rye-grass with white clover and perhaps suckling clover is the most practical, and not at all unattractive, type of lawn. The presence of clover in such a sward maintains a colour in the turf and a healthy growth of the grass which can be achieved in a pure grass sward only by frequent manurial treatment. Rye-grass is a plant which is very competitive with other grasses, and where it is sown the finer grasses, such as the fescues and brown top, have little chance to compete successfully.

The best kind of rye-grass for lawns is the New Zealand certified type, the plants of this variety being dense and leafy with moderately short, upright leaves. Irish rye, although much advocated for this purpose, is smaller, less vigorous, and shorter lived under our conditions. A virtue of rye-grass, and the reason for its popularity in ready-made seeds mixtures, is the rate at which it establishes and forms a presentable looking turf from seed. Rye-grass areas which have become

sparse and tufty as a result of the plants thinning out can be renovated by raking or harrowing and re-seeding.

The second grass mentioned in the "English grass" list, *crested dogstail*, does not appear to have any value as a lawn grass under Victorian conditions, and is mentioned only because it is so often included in seeds mixtures for lawns. It is a comparatively short lived plant with rather broad leaves and a non turf-forming, lax habit of growth.

Kentucky blue grass is a plant which occupies an "in-between" place in the scale of lawn grasses. By itself it makes a somewhat sparse turf, but it spreads by means of long, slender, underground runners (rhizomes) and appears to be able to mix well with other grasses and to fill in any gaps which may occur. It also blends quite well with buffalo and couch and thus may help to improve the winter colour of lawns of this type. It is fairly resistant to dry conditions, a fact which gives it an added value.

The remaining grasses, the bent grasses and the fescues are the real fine-turf forming grasses, although in this respect the different bents vary very conspicuously. The fescue family includes many species and varieties, but for practical purposes in Victoria only one kind known as Chewing's fescue need be considered. The seed used in Victoria comes principally from New Zealand, where the grass is used to some extent for grazing, but is cultivated mainly for seed production.

Chewing's fescue is a very fine-leaved grass, producing numerous erect-growing leaves. It produces a very dense, fine-textured lawn, but the plants are not always long lived, and for this reason pure sowings of Chewing's fescue are not recommended. Its special virtue is its ability to blend with the bent grasses. Its crisp, erect leaves act like the pile of a carpet, and give the lawn density and depth. If good quality seed be obtained Chewing's fescue will establish rapidly from seed. The seeds are fairly large, but the seedlings are not strongly competitive like those of rye-grass and act as a good nurse crop for the smaller bent seedlings.

The bent grass family includes many species and varieties the classification of which is difficult. For the purpose of this article only common names will be used and the discussion limited to those kinds which are available commercially and are in use for lawn planting. Under favorable conditions most of the bents are aggressive and thoroughly permanent, so that the choice of the variety of bent grass seed to be sown is perhaps the most important factor in the establishment of a high quality lawn.

The most satisfactory and reliable bent grass seed available commercially is New Zealand certified *brown top*—it is certified to be free of red top, a coarse grass which will be mentioned later. Brown top is a semi-tufted plant, without surface creeping runners, but with usually some development of short rhizomes or underground shoots. It produces very numerous new tillers or shoots from below the level of the mower blade and develops under mowing a very dense leafy sward. In colour, brown top is an attractive lightish green, and it is able to withstand continuous close cutting, a character which makes it very valuable for playing greens as well as for lawns. Brown top seed comes principally from New Zealand, where it grows mainly in rather wet areas. It requires an abundant supply of water in the summer to keep it in good condition. It is rapidly and deservedly becoming the standard grass for putting and bowling greens and also for the better class of garden lawn. Although it is customary to mix other grasses, particularly Chewing's fescue, with this species, it has been shown that first-class lawns can be established from pure sowings of brown top, the seed of which although so very tiny, germinates and establishes with remarkable vigour.

A different type of bent grass, found in New Zealand and described as *dryland brown top*, is coming to be recognized as a valuable grass for Victorian conditions. This grass has well developed rhizomes and is more able to survive dry conditions than is the ordinary brown top. It may burn off just as badly in hot weather, but the underground runners remain alive and will sprout again with the autumn rains. It is a darker shade of green, sometimes appearing almost greyish, and

has narrower leaves than the ordinary brown top, but produces a turf of at least as great a density and quality.

A rather similar type of grass is to be found in many parts of Victoria, around Woodend, Ballarat, and parts of Gippsland, and where available is being used quite successfully for planting lawns and playing greens. In some cases it occurs naturally as the main constituent in certain country golf course fairways. It is a persistent and dense-growing plant with vigorous rhizomes and can be planted by digging up the plants, chopping them up, broadcasting the pieces, and lightly covering them with soil.

The other type of bent grass which is extensively used and frequently simply called "creeping bent," is more properly called *red top* or *fiorin*. Red top is a very different plant from brown top, although the seeds of the two species are remarkably similar. It is broad leaved, with well developed and stout, but not numerous, rhizomes, which usually come to the surface some distance from the centre of the plant, with the result that red top makes a coarse and open turf and is not naturally a sward-forming grass. The seed comes chiefly from America, where it is an important agricultural grass.

It is wrong, therefore, to call red top creeping bent, and such a description leads to its confusion with the third main type of bent grass to be described, the true *creeping bent*. This grass is characterized by having long surface-creeping runners (stolons), which spread over the surface of the ground and intermingle to produce a dense and leafy turf. This type is a rather light seeder, and true creeping bent seed is expensive. If a sample of such seed is sown, the plants produced, when examined individually, show considerable variation from one to another. This fact has led to the selection and propagation vegetatively of single plants of superior merit.

Bent grass varieties do not grow perfectly true from seed, so that special selections must be multiplied by planting pieces of the original plant. Pieces of the runners of this type strike very readily, and a stock for planting can be produced from a single plant in quite a short time. In planting a lawn by the vegetative method, as distinct from the sowing of seed, one may either dibble in pieces of runners over the whole area, or cut up the runners into short lengths, spread this material over the surface, and cover lightly with soil.

Single plants of brown top (left) and red top (right). Compare the dense multi-tillered habit of brown top with the sparse development and foliage of red top.

[Jnl. Board Greenkeeping Res.

This vegetative method of planting greens and lawns with stolons has received greatest prominence in America, and numerous varieties are available there for the purpose. The same practice is quite commonly adopted in Victoria, and at least two varieties of the true creeping bent have been commercialized around Melbourne.

Genuine seed of creeping bent is available under the name of *Cocoos bent*, and although this seed is expensive, it can be established successfully with a very light seeding, as the plants rapidly produce surface runners and cover any bare areas. The stoloniferous bents are usually found occurring naturally in low-lying fairly damp places, and cannot therefore be expected to succeed on well-drained higher ground without adequate watering. This creeping type of grass, on account of its abundant production of runners, tends to become rather spongy with age, and requires rather frequent topdressing with soil to maintain fresh growth and a firm surface.

Seed Mixtures

From the above discussion it will be seen that there are not many grasses which can be expected to give good results, and the sowing of elaborate mixtures containing seeds of a number of different grasses is not justified, and it even may lead to the introduction of undesirable kinds. Certainly there is a choice of grasses for different purposes and for varying conditions of soil and climate. The wisest plan, therefore, is to sow only the grass or grasses which it is known will succeed and which will produce a turf of the kind required.

It may be argued that if a comprehensive mixture of grasses is sown, those best suited to the conditions will ultimately survive. While this may be partly the case, it is also true that those grasses which are most successful and competitive in the early stages are rarely grasses of the most permanent type, or of the kind that produce turf of the best quality. For this reason the purchase of ready-made lawn seeds mixtures of indefinite composition is not recommended.

It is wiser to buy seed of the separate kind or kinds required and to mix them in the desired proportion. Further, by so doing, seed of higher quality is usually obtained. Rye-grass and bent grass seed usually may be relied upon to germinate readily, and seed of these species retains its vitality for several years. Chewing's fescue seed on the other hand is less reliable, and care should be taken to obtain fresh seed, free from weed seeds, and it should not be kept for any considerable time before being sown.

In the following specimen seeds mixtures, the seeding rates give the amount of seed of each kind to be included in a mixture for the sowing of 100 square yards of lawn. The seeding rates given are somewhat lighter than are sometimes recommended, but with average quality seed and a properly prepared seed bed they are known to be adequate.

STANDARD MIXTURE FOR FIRST QUALITY FINE LAWN.

	lb.
Chewing's Fescue	5
Brown Top (N.Z. certified) ..	2

This mixture is also suitable for bowling greens and golf greens. The inclusion of any other grasses in this mixture not only is unnecessary but also impairs the quality of the turf produced. The cost of establishing such a lawn may be reduced by omitting the fescue altogether, in which case the brown top seeding rate may be increased to 3 lb. per 100 square yards. If water supply is limited and for warmer conditions, substitute dryland brown top for ordinary brown top.

FOR RAPID ESTABLISHMENT ON HEAVY FERTILE SOIL.

	lb.
Perennial rye-grass (N.Z. certified).	10

BACK LAWN, LARGE SCALE LAWN, OR PARK.

	lb.
Perennial rye-grass	8
Kentucky blue grass ..	2
Brown top	1
White clover	½

For drier conditions include couch grass, 1 lb. Mixtures containing couch are best sown in the spring, as this grass requires warm, moist conditions for germination. Where considerable areas are to be sown, a mixture compounded in the above proportions may be sown at a reduced rate.

Single plants of the Victorian bents in comparison with New Zealand brown top. Note the more vigorous growth and greater spread of the Victorian grasses (the three rows from left of picture).

For tennis courts a pure sward of couch grass makes the best turf, as grass courts are not normally used during the dormant period of this species. Couch usually is established by chopping up and planting the runners, but may be grown from seed if sown in November and carefully watered until established.

Manurial Treatment of Lawns

Perhaps no single factor is more important in deciding the fate of a lawn than is the manurial treatment which it receives, both before and after sowing. The use of a good topsoil and its careful preparation before sowing will simplify the problem, but even so the maintenance of a fine quality lawn in good weed-free condition requires constant care and attention. The adoption of a systematic scheme of manurial treatment right from the time of sowing will enormously reduce the amount of time spent in hand weeding, and at the same time improve the vigour, density and appearance of the sward. One comes across such widely divergent recommendations as to what manures or fertilizers should be applied to lawns, that some discussion of the principles involved is necessary before making fresh recommendations.

There are usually only three plant foods which require to be supplied to maintain soil fertility—nitrogen, phosphate, and potash. On normal soils potash is not often deficient, at least so far as the requirement of the turf grasses is concerned, leaving only nitrogen and phosphate to be considered. In addition to the mere supplying of the necessary plant foods, there is another important phase of the maintenance of turf—the control of weeds. In most cases, that is where a pure grass sward is the objective, clovers must be classed as weeds.

The maintenance of a mixed sward of grasses and clovers is a relatively simple matter, requiring only the application of adequate phosphate to encourage clover growth. An annual application of superphosphate at the rate of 3 to 4 lb. per 100 square yards is sufficient for this purpose. The clover growth induced will in time build up the nitrogen reserves in the soil, and soil fertility is not only maintained but also improved. Where clovers are eliminated this cheap and convenient source of nitrogen is eliminated along with them, and if grass growth is to be kept going, adequate nitrogen must be regularly applied. Emphasis is laid on the necessity for making regular applications of nitrogenous manures at fairly short intervals.

Nitrogenous manures, particularly in the inorganic form, are rapidly taken up by plants, and it is not possible to supply say a full year's needs in a single

application. An attempt to do so would produce an enormous flush of growth, followed by a long period of greatly reduced growth. Large doses of inorganic fertilizers may also result in severe scorching of the turf.

In addition to regular supplies of nitrogen, a pure grass sward requires a regular but constantly available supply of phosphate. This is a fact which is often not fully appreciated in the manurial treatment of pure grass lawns. A shortage of phosphate will result in the grass becoming thin and open, as a result of reduced production of new shoots. A phosphate-starved turf also develops a curious bronzed colouration, which is most noticeable during the winter.

These plant foods, nitrogen and phosphate, may be applied either as organic (natural) or inorganic (artificial) manures, the difference between the two classes being largely a matter of weed control. The organic manures have no value whatever for the control of weeds and clovers and their exclusive use must entirely fail to produce a clean and weed-free turf. Of the inorganic fertilizers, sulphate of ammonia stands above all others as a weed controlling agent, and is also a cheap and convenient means of applying nitrogen. The use of a small quantity of sulphate of iron in conjunction with sulphate of ammonia gives improved weed control. Phosphate is most conveniently applied as superphosphate, an annual dressing at 3 lb. per 100 square yards being sufficient. If used in combination with sulphate of ammonia and sulphate of iron, there need be no fear that the application of super. at the above rate will unduly encourage clover growth.

The following schedule of manurial treatment is recommended for a garden lawn (quantities in lb. per 100 square yards) :—

	lb.
March—	
Superphosphate	3
Sulphate of ammonia ..	4½
Sulphate of iron	1½
June—	
Sulphate of ammonia ..	4½
September—	
Sulphate of ammonia ..	4½
Sulphate of iron	1½
December—	
Sulphate of ammonia ..	4½

It is not suggested that this schedule should be slavishly followed for the entire life of a lawn, but it is recommended for adoption for the first two or three years, the application for March (with the omission of the sulphate of iron) being taken as the treatment at sowing time.

Poor soils may be enriched by the digging-in of some bulky organic manure, or the growing and digging-in of a green manure crop, before the lawn is sown, but some sulphate of ammonia should always be applied at seeding time to ensure a rapid establishment of the grass. The continuous use of heavy applications of sulphate of ammonia and sulphate of iron may in time result in a hardening of the surface soil, accompanied by a reduction in its water holding capacity, and as soon as the lawn becomes reasonably free of weeds, the use of sulphate of iron may be discontinued and the amount of sulphate of ammonia applied gradually reduced, the balance of the nitrogen supply being provided by the use of organic nitrogenous manures such as castor meal, malt combings, blood manure, &c. A careful watch should be kept, however, for any increase in the weed population, and at no time should the use of sulphate of ammonia be completely discontinued.

Organic manures, because of their generally lower nitrogen content, are used at rates exceeding that given above for sulphate of ammonia. To enable the correct use of these manures the following substitution table is provided, showing the number of pounds of each of the common organic manures to substitute for 1 lb. of sulphate of ammonia in order to supply the same amount of nitrogen. The figures cannot be exact, as the nitrogen content of these manures varies somewhat, but an approximate average figure for each (as stated) is used as a basis for calculation.

Manure.	Average Nitrogen Content.	Pounds to Replace 1 lb. Sulphate Ammonia.
	Per cent.	
Sulphate of ammonia	20·6	1
Blood and bone ..	5·5	3·7
Dried blood ..	12·0	1·7
Blood manure ..	8·0	2·6
Castor meal ..	4·5	4·6
Malt combings ..	3·5	5·9

[*continued on page 483.*

VEGETABLE GROWING IN THE HOME GARDEN

By GEORGE HYAM .... *Horticultural Supervisor*

The first instalment of this article dealing with general cultivation methods, including layout, soil preparation, building up the soil, &c., appeared in the August issue of this Journal. This instalment includes sections dealing with Leaf Vegetables, Root Crops, Legumes, Salad Vegetables, Tomatoes, and Vine Vegetables. Sowing and planting times, recommended varieties, planting details and pest control will be shown in tabulated form in the concluding instalment of this series.

THE LEAF VEGETABLES

IN general, the cultivation of all leaf vegetables is much the same. All require a heavily-enriched soil with a higher percentage of nitrogenous manures than most other crops. The majority belong to the brassica or cabbage family, which includes cabbage, cauliflower, Brussels sprouts, kale or borecole, broccoli and Chinese cabbage. Silver beet and spinach are of different orders, but they require similar soil conditions to the brassicas. Lettuce is a leaf crop which also requires rich soil, but this will be dealt with under the salad group.

No leaf crop will do well or be at its best unless the soil has been heavily manured, preferably with an organic manure before planting and without several side dressings of fertilizer or liquid manure being applied during growth. These crops must never suffer from drought, for if they receive a check in growth through lack of plant food or moisture, their leaves will be coarse in texture, and the hearting sorts may run to seed without hearting. All these vegetables, with the exception of silver beet, which can be sown direct or transplanted, and spinach, which is always sown from seed, are raised in seed-beds and transplanted about eight weeks after sowing.

All seedlings should be planted out so that their lowest leaves are just above soil level. Though they can be planted a little closer in the home garden than is customary in commercial gardens as small heads are generally preferred in the household, too close planting will cause them to run to seed before full development.

It is usual to plant leaf crops as the first crop in the garden rotation on beds which have had a heavy dressing of organic manure. They are then followed by crops which will benefit by the manure residue they leave behind. The following crop is generally a root vegetable. Two leaf crops should never follow one another, and if tomatoes, potatoes, or vine vegetables follow them, the beds should receive another dressing of manure before planting. Leaf vegetables are benefited if they follow crops of peas or beans, as these crops fix nitrogen in soil for the benefit of the succeeding crop.

All leaf crops are attractive to chewing and sucking insects, and regular dustings or sprayings with an insecticide is essential. For the brassicas, these should commence at the seedling stage, and be applied every ten days or so until maturity. If the young growing tip is damaged, leaf vegetables will never heart properly. The non-hearting leaf crops should be dusted at the first appearance of any attack.

As the period of use of matured hearting vegetables only averages about one month, the home gardener should limit his plantings to a few plants of any one variety, and provide for successional plantings of appropriate varieties. Where space is limited the best leaf crops are those which provide continuous pickings over an extended period,

Green Sprouting Broccoli.—The small, prolific flower-heads make a delicious vegetable when cooked as for cauliflower.

such as Brussels sprouts, which can be picked from May to September; sprouting broccoli which grows a series of cauliflower-like heads for about three months, or curly kale (borecole) which produces an abundance of leaves over a period of twelve months, if they are planted in the spring, and when cooked, tastes like cabbage. Regular pickings of these vegetables is necessary to keep them in continuous production and they should receive monthly side dressings of fertilizer throughout their growth.

Silver beet is another crop which will supply an all-the-year-round crop of leaves. It can be kept in production for twelve months, but better quality is obtained from plants put out in spring and summer and replaced after six months. Silver beet should receive frequent manurial side-dressings.

Spinach requires considerable space for the quantity harvested from it. Care should be taken to sow the right kind for the season, the prickly-seeded kind being sown for the winter crop and the round-seeded varieties for the summer. In the home garden, the New Zealand spinach is the most satisfactory. It yields throughout the season, and it will grow in any odd corner of the garden. It needs no special manuring and its cultivation consists in occasional waterings and repeated pickings or cutting back to induce new growth. The young tips of its numerous prolific stems are used, and it has all the dietetic value of ordinary spinach. New Zealand spinach is usually remarkably free from any insect pests or disease and is very hardy, except that heavy frosts may cut it back. A planting will last for twelve months.

Chinese cabbage is grown in the same way as silver beet and its leaves are cooked in the same way. Its young leaves make a nice addition to salads, and it will survive hot summer conditions in districts where it is hard to grow lettuce.

Soil Preparation for Leaf Vegetables

Dig in a 3 or 4 inch layer of stable manure or a 2 inch layer of compost two or three weeks before planting. Use blood and bone at the rate of up to 4 oz. to the square yard if little or none of the above is available.

Planting Out Leaf Vegetables

Select sturdy straight-stemmed plants. Reject any showing abnormal growth and see that the centre growing-tip is perfect. After planting, consolidate the soil around the roots by watering, preferably with a weak nutrient solution (see page 388, August *Journal*), and dust them with an insecticide.

Fertilizing During Growth

Every month during growth, apply side-dressings of a mixture of three parts of super. and one part each of sulphate of ammonia and sulphate of potash at the rate of about a teaspoonful per plant, or alternatively, water with liquid manure. The latter is the best to use in warm weather.

Organic liquid manure is best made by suspending a bag of animal manure in water and allowing to soak for at least forty-eight hours.

Harvesting Leaf Crops

Cabbages and cauliflowers can be cut and used before, as well as at, full maturity, and thus prolong their season. If the whole head is not required for immediate use the succulence of the remainder will be retained for several days if the plant is pulled up with the roots attached, and the stem stood in water until the whole head is used.

Brussels Sprouts

The lower leaves should be pulled off as soon as the sprouts start to swell, leaving those protecting the sprouts just budding. Sprouts that have "blown" and not formed tight buds, should be removed as soon as possible. These can be cut up and served like cabbage.

Sprouting Broccoli

Pick when the flowers are in the tight-bud stage with about three or four inches of the stem attached. Do not allow any of the heads to burst into flower, otherwise further development will be retarded.

Borecole (Curly Kale), Silver Beet, Chinese Cabbage

Pick the leaves with a downward pull. Avoid leaving stubs of stalk on the main stems. Leaves should be picked before they reach full maturity and matured leaves must be removed regularly even if they are not required for consumption.

Seed Treatment

As a prevention against seed-borne diseases, immerse the brassica seeds in hot water maintained at 122° F., for a period of twenty minutes. Dust silver beet and spinach seed with Cuprox or Agrosan.

Borecole (Curly Kale).—The young leaves are picked and cooked similarly to silver beet.

THE ROOT CROPS

Carrots, parsnips, and red beet are always useful in the home garden, and by making two seasonal sowings, supplies of these will be available all the year round. If they follow leaf crops in accordance with the usual rotation, they will only require a base dressing of superphosphate, preferably applied in bands each side of the seed row, at the rate of about 1 oz. to 6 ft. of row. Excessive organic or nitrogenous manures will cause forked or distorted roots. The soil should be dug deeply and raked to the finest possible tilth before sowing, and the plants should be thinned to 2 inches apart when they are

Row of young carrots before thinning.

The same row after thinning.

Kohl-rabi (Turnip-Rooted Cabbage) has a high vitamin C content.

in the two-leaved stage. This should be followed by a second thinning to the correct final spacing, about a month later.

The seeds of carrots and parsnips are always sown direct, as these roots do not transplant readily. Red beet thinnings can be used to fill up any gaps in the rows, but the transplanted roots will be of inferior quality. The soil should be moist when thinning is done. Afterwards, the rows should be watered to consolidate the soil round the remaining plants. Beds sown in summer with root crops should be mulched to protect the germinating seed from heat and to retain surface moisture.

Spring sown carrots are very subject to aphis attack and frequent dustings with nicotine or D.D.T. dusts must be applied, commencing as soon the carrots germinate. November–December sowing is best for the main crop of carrots as aphis is inactive at this time and dusting is seldom necessary. This crop will provide roots for autumn, winter, and early spring use.

Parsnip seed soon loses its germinating powers and should not be more than twelve months old when sown. Parsnips can be affected by the same aphis as carrots in the spring, but not to the same extent. They be should dusted at the first sign of any attack.

White turnips, swedes, and kohl-rabi are members of the cabbage or brassica family, and although they do not require the heavy manuring used for the leaf crops, the fertilizer for them should include some sulphate of ammonia, using about four parts superphosphate and one part sulphate of ammonia and applying in bands as for other roots. White turnips could be grown in succession throughout the year, but summer-maturing roots are inclined to be coarse and hot. Swedes are a winter-maturing crop only, but the roots may be readily stored for some weeks. White turnips mature quickly and can be grown as a catch crop between rows of slower-maturing crops.

Kohl-rabi, the turnip-rooted cabbage, is worth growing. It has a high vitamin C content. The "root" is really a swollen stem formed well above the ground and is cooked and served like a turnip. The young leaves can be picked and cooked like leaf vegetables. This is the only root that can be satisfactorily transplanted. Kohl-rabi is usually raised in seed beds and transplanted like cabbage, but it can be sown direct and thinned out.

All the roots of the brassica family are subject to the same pests as the cabbage and should be dusted accordingly.

Soil Preparation for Root Crops

Dig deeply; work down to a fine tilth. For preference, apply the fertilizer in bands. No fertilizer during growth is required.

Sowing Root Crops

Sow as thinly as possible in shallow drills. The first thinning should be done when the plants are in the two-leaved stage.

Cultivation

Hoe out weeds between rows and pull out weeds in the rows.

Harvesting Root Crops

Lift roots as required for use. They may be held in the ground until they show signs of seed-stems appearing. Then they should be all lifted and stored in the "clamps" to be described later in this series. They may be used when semi-mature, and if alternate plants are lifted at this stage, the remaining roots will increase in size. Water dry soil before lifting.

Seed Treatment

Dust red beet seed with Agrosan or Cuprox. Other root seeds do not require treatment.

THE LEGUME VEGETABLES

The legume group is most important in any system of crop rotation in the garden. Peas and beans can follow any other crop and any crop can succeed them. But as they add nitrogen to the soil, it is best to follow them with crops which need the most nitrates, such as leaf crops or vine vegetables. Tomatoes or potatoes also do well after peas or beans.

All legumes have a high food value and this value, as well as their succulence, quickly deteriorates after picking and for this reason, apart from their value as a rotation crop, they should be given a high priority in the home garden.

Peas, however, do not show a high yield in relation to the space they occupy so that, in small areas, they should be mainly grown to mature in late autumn or early spring when the beds will not be so fully occupied. They are not frost-sensitive, except in the flowering or podding stage, so can be grown in beds which will be afterwards planted with early leaf crops, or summer vegetables like tomatoes or vine vegetables. They may be also followed by beans, as although they are both legumes, they are not subject to the same diseases.

A successive crop of peas and beans is excellent to precede mid-season crops of leaf vegetables. The yield of peas in the home garden can be enhanced by careful soil preparation, selection of the proper varieties for the times of sowing, and the provision of support for them to climb upon. Tall-growing varieties like Telephone, when properly trellised, will provide the greatest yield, and a longer period of picking.

French and climbing beans are summer crops and they give a much better return than peas from small plots in summer. They should never be sown until all danger of frost is past, and even if frosts are absent, they never start into sturdy growth until the soil temperature is fairly high. Too early sowing often results in attacks by fungous diseases. Annual varieties of climbing beans, like Epicure, should not be sown before late October. The perennial varieties such as Scarlet Runner, White Monarch, or Czar, are best sown in November. The first year these will yield good crops in the autumn, and in following seasons, in spring and autumn. Climbing beans are apt to drop their blossoms in the hot weather, though this can be avoided to some extent by frequent sprinklings with the hose on hot days.

A climbing-bean trellis made from saplings. When the beans cover the trellis they act as a useful windbreak for other vegetables.

Dwarf beans in double rows support each other against wind.

Perennial climbing beans can be planted so as to train on fences and allowed to remain for three or four years or they can be planted in beds provided with a suitable trellis, lifting and transplanting the roots in winter so as to allow a change of crop.

Both peas and beans, unlike most other summer vegetables, are best watered by an overhead spray. This helps pollination, and for beans it helps to control attacks by red spider.

Broad beans yield well and are frost hardy. Sown in April and May, they will produce in August and September, which are slack months for vegetables. They can be sown at other times, but earlier and winter sown crops are liable to fungous troubles in the winter, and late spring maturing broad beans are more subject to attacks by aphis.

Late crops can be sown in July and August. Pinch out the tips of tall-growing varieties when the first flowers open to induce better setting and more stems. The tips can be cooked and used like spinach. The young flat pods, picked before the seed has been formed, can be sliced and cooked like French beans. All legumes do best in a well-limed soil applied before planting, and this dressing of lime should never be omitted when beds are being prepared for broad beans.

Soil Preparation for Legume Crops

For peas, climbing beans, and broad beans, dig deeply, opening out a trench along the seed row the width of a spade, and fork into the subsoil three inches of rotted manure or compost to encourage deep rooting. Dwarf

The transplanted lettuce thinnings at sides will mature about three weeks later than the directly-sown plants in the centre row.

French beans are shallow rooting and the manure should be forked into the upper soil. If the beds were not limed for the previous crop, apply three weeks before digging and in any case, lime the ground before planting broad beans. Apply 1 oz. of super. and sulphate of potash (four parts to one part) in double bands to each 6 ft. of row before sowing. If no organic manure is used, use 2 oz. of super., sulphate of ammonia, and sulphate of potash (4 : 1 : 1).

Sowing Legume Crops

Don't soak the seed before sowing; it may cause the seed to rot. Soak the soil instead. In summer, make a shallow drill to the correct depth and flood this with water a few hours before sowing. In the home garden, legumes are best sown in double rows about 6 to 8 inches apart for mutual support. Place each seed or thin out to correct distance. Don't overcrowd the plants. The covering soil, if light and sandy, should be compacted, except for beans, whose young shoots are apt to break if the soil surface is hard and caked.

Cultivation

When hoeing and weeding, draw the soil towards the plants without covering them deeply. Provide support for peas and climbing beans as soon as they come through. Support rows of broad beans by horizontal strings attached to stakes when they are about 24 inches high. Without this support, they are easily blown down.

Harvesting Legumes

Don't allow the pods to get over-mature, as this will check later production. Cut or nip off the pods; don't pull them off. Pulling damages their stems and breaks off flowers or immature pods.

Seed Treatment

Dusting the seed with Tetroc helps to control seed-borne disease and protects the seed to some extent from rots occurring after excessive rain.

THE SALAD CROPS

The value of salads in human diet is being increasingly recognized, and any vegetable that is to be eaten raw quickly loses its food value and flavour if stored before use. Salad vegetables may be grown even in the smallest gardens. The main salad vegetables—lettuce, onions, tomatoes, cucumbers, and celery differ in their cultural requirements, and to some extent, in their place in garden rotation. The base of all mixed salads is lettuce, which requires the same soil conditions as the leaf-crop group, some of which are used to some extent as ingredients of salads.

Lettuce will never be at its best unless grown in highly-manured, well-drained soil and grown without check through drought. Lettuce of one kind or another can be grown all the year round, but it is important that the right varieties for each season should be planted. Planting out of season results in seed-heads forming without hearting, and various fungous troubles may occur.

In addition to the base manuring before planting, side-dressings of liquid manure at fortnightly intervals are necessary to grow good lettuce. Watering by furrows rather than overhead sprinklings will avoid "slime" and mildew.

There are two near relatives of the ordinary lettuce which are not so well-known—endive and cos lettuce, both of which make an

interesting addition to salads. They are also of value for use instead of lettuce in the colder months when lettuce is not at its best. They are well worth a place in the home garden.

Endive is sometimes called curly lettuce. It does not heart tightly and is generally less liable to disease than hearting lettuce. Its leaves are attractive and may be pulled at any time without lifting the whole plant. All the leaves are usable. Its slightly bitter flavour is appreciated by some people, but if not to taste, the bitterness may be removed by blanching the plants for a few days before picking. This is done by tying the leaves up and covering with a flower pot or box. The cultivation of endive is the same as for lettuce.

Endive (Curly Lettuce) does not readily run to seed, and all the leaves are usable.

Cos lettuce has a different flavour from lettuce or endive. It forms upright, stem-clasping leaves and thus forms a tall conical heart. It will flourish in the winter although, like endive, it can be grown in the summer or spring. Cos lettuce requires the same cultural treatment as the common lettuce. All of these leaf crops are best sown direct and thinned out, though they will transplant. Except in the cooler weather, transplants are apt to run to seed. Some thinnings of lettuce may be used for transplanting into a row alongside those sown direct, and the heads from these will mature two or three weeks later, thus extending the period of picking.

Cos lettuce grows well in both winter and summer.

Spring onions are merely the seedlings of any onion, preferably of the white varieties. The surplus plants of any onion seed-bed can be left and used for salads, and afterwards any early white onion seed can be sown in rows at any time during the autumn and spring for use as "spring" onions. They will be ready for use about 8 or 10 weeks after sowing and can be used over several weeks. As bulbs are not wanted, no special soil conditions are necessary for spring onions.

The leaves of shallots and chives are used in the same way as spring onions. For salad use the leaves are cut off just above their bulbs, which will sprout again and produce successive crops of leaves throughout their long growing season. These will be referred to under heading "The Herb Garden" later in this series.

The cultivation of cucumbers is dealt with under "Vine Vegetables"; celery, tomatoes, and peppers will be described separately.

Radishes are one of the easiest of all vegetables to grow and are the quickest maturing crop in the vegetable garden, being ready for use in six to eight weeks after sowing. They can be sown between or in the rows of any other crop as they will mature long before the other vegetables are fully grown. They require no special soil treatment, and can be sown at any time. Radishes are useful to mark the rows of slow germinating crops like carrots or parsnips. If sown with the seed of these crops, the radishes coming up quickly will be fully-matured when the carrots or parsnips reach the thinning out stage.

The second thinnings of carrots, red beet and turnips can be used in salads.

Method of tying a tomato plant to the stake. The knot should be at the back of the stake.

Soil Preparation for Salad Crops

For the lettuces and endive prepare as for the leaf vegetables. In winter, spring, and autumn, plant in the full sun; in summer, lettuce does well under partial shade. In addition to the organic manure, lettuce responds to a dressing of sulphate of potash, applied before planting at the rate of 1 oz. to the square yard.

Fertilizing During Growth

As soon as lettuce starts to heart, apply liquid manure fortnightly. For non-hearting kinds, apply these dressings six weeks after planting.

Cultivation

Avoid deep hoeing near the plants. Water by means of a shallow furrow. Overhead watering is likely to cause mildew and "slime" or in summer the leaves may scorch. Lettuce beds should be mulched in the hotter months.

Harvesting

Hearting lettuce and endive should be pulled up by the roots, unless they are to be used immediately. If they are to be kept for sometime before use, stand the roots in water. This will keep them crisp. Spring onions are pulled up as required just before use or placed in water if they are to be kept for some time before using.

Seed treatment is not necessary for lettuce or onions.

TOMATOES

Tomatoes are a favorite crop of the home gardener, but there are many casualties amongst those planted which can be avoided by a little knowledge of the special requirements of this attractive and useful vegetable. As the soil treatment for tomatoes is specific, it is not so important that they should follow any particular crop. They should never follow potatoes as the potato is subject to some of the diseases that affect the tomato and also draws on the soil for similar plant foods. Tomatoes always do well after legume crops and on new ground. The major cause of failure with tomatoes is planting too early for the district. To flourish, they must have a high soil temperature, although they may just grow on during the early spring if protected from frost. It is these early-planted tomatoes however which suffer most from wilt and other fungous diseases. Growing them in poor soil without adequate and proper manures is also another cause of failure.

In the home garden not many plants are required to provide ample supplies of tomatoes, so that it is better to concentrate on a few plants and look after them well, rather than to plant more and just let them run. It is better to plant successively some plants of early, mid-season and late varieties rather than one kind. In the home garden, it is desirable to stake and tie even those varieties which are unpruned and allowed to run by commercial growers.

[*continued on page 486*

LIVE STOCK NOTES

Compiled by A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

MEAT PRODUCTION

IT may be of interest to meat producers to note that during 1945–46, the numbers of all classes of live stock slaughtered in Victoria were considerably less than during either of the two preceding years. Slaughterings of live stock during the last three years are set out in the table and show that meat consumers and exporters are still feeling the effects of the 1944 and 1945 drought.

—	1943–44.	1944–45.	1945–46.
Sheep	4,739,752	4,882,083	2,906,341
Lambs	4,252,131	3,863,190	2,240,154
Bullocks	163,723	164,183	128,516
Cows	221,985	236,258	175,517
Young Cattle ..	76,617	79,489	45,781
Calves	297,187	319,202	232,419
Pigs	421,777	432,293	325,441

BUTTER AND CHEESE PRODUCTION

Victorian dairy-farmers have been able to produce more butter and cheese during the past twelve months from fewer cows. This was largely because of the very favourable season during late summer, autumn, and winter when pasture growth was particularly good.

—	1943–44.	1944–45.	1945–46.
Butter (tons)	48,864	46,443	49,786
Cheese (tons)	11,868	12,205	15,032

RYECORN FOR PIGS

Although practically unprocurable for stock feeding in Victoria, it is anticipated that supplies of ryecorn will be available in future as a result of the increasing attention being given to this crop as a means of controlling soil drift in the Mallee. To augment the limited local experience with this cereal as a stock food and to ascertain its value in comparison with wheat, the Department

recently concluded an experiment in feeding ryecorn to "fattening" pigs at the Rutherglen Experiment Farm.

Mr. N. C. Killeen, B.Agr.Sc., Agricultural Research Officer at the Farm, points out that, although the pigs fed on ryecorn did not fatten as rapidly as the pigs fed on wheat, the ryecorn appeared to be satisfactory as a food for pig fattening, and could be used as a partial or total substitute for wheat.

In the experiment, three even lots each of 14 pigs with an average liveweight of 97 lb., were given one-third gallon of separated milk daily for each pig, and allowed free access to self-feeders of crushed grain. Lot 1 received crushed ryecorn, Lot 2 crushed wheat, Lot 3 a mixture of equal parts of crushed wheat and crushed ryecorn.

After 99 days on these foods, the average liveweight of the pigs fed on ryecorn was 178 lb.; the pigs fed on wheat 212 lb., and the pigs fed on a mixture of wheat and ryecorn, 206 lb.

As a result of this experiment it is shown that ryecorn and wheat can be fed satisfactorily in combination.

Any ryecorn which is fed to pigs should be free from ergot.

QUADRUPLET CALVES

On the 29th of August, 1946, a grade Ayrshire cow owned by Mr. G. Wells of Bacchus Marsh, dropped four bull calves. The sire is also a grade Ayrshire bred by Mr. Wells. The dam is an average-sized Ayrshire cow of good conformation and has had three or four single calves previously. Three of the quadruplets were brown and white and the fourth was predominantly white. The colouring is the normal Ayrshire colour, but the calves were not particularly alike and in this respect would easily pass as of different parentage.

They are strong and quite normal in appearance and are even in size and conformation. Their weights about 36 hours after birth were 47, 41, 39, and 35 lb. respectively, making a total of 162 lb. liveweight.

[J. D. DESMOND, Dairy Supervisor.]

EGG QUALITY

Egg quality may be affected by inferior breeding stock, inadequate feeding, unclean housing, unclean and incorrect methods of gathering and packing the eggs, keeping the eggs at high temperature, holding them too long before marketing, and rough handling on the farm and during transit to market.

Eggs should be collected at least twice a day, and packed when cool in clean fillers with the large ends up, and with no other material, such as chaff. They should be kept in a cool place, and during the warmer period of the year, marketed at least twice weekly.

Clean eggs with a good shell texture realize higher prices than dirty thin-shelled eggs. The shell of an egg is porous, and contact with dirt of any kind endangers the quality of the contents.

Ample nesting material should be provided with room in the nests, and

Grade Ayrshire cow owned by Mr. G. Wells, Bacchus Marsh, is proud mother of quadruplets, all doing well.

dry litter on the floors. These precautions will considerably increase the percentage of clean eggs gathered.

[H. F. Clinton, Poultry Expert.]

"PINK-EYE" IN STOCK

"Pink-eye" is a complaint occurring in sheep and cattle, especially during the spring, summer, and autumn months when flies are numerous. Although not fatal, it causes much pain and discomfort to affected animals. Feeding is interfered with and condition is rapidly lost.

The first symptom usually noticed is a slight watery discharge from the inner corner of the eye. Following this, the eye and surrounding membranes become inflamed and blood shot and the discharge changes to a thick whitish or yellowish stream. Later a milky film may form over the eye-ball, the surface of which may become severely ulcerated.

Up to the present, no reliable line of treatment has been discovered, but considerable relief can be effected as follows:—

First, clean the eye with boracic acid solution, two teaspoonfuls in a pint of warm boiled water. With an eye dropper place a few drops of the following lotion into the affected eye twice daily:—

Sulphate of zinc	..	½ ounce
Boiled rainwater	..	1¼ pints

If practicable the stock should be kept in sheltered paddocks so that they are handy for treatment.

Mild cases may recover in about ten days, but in severe cases the condition may continue for several weeks.

[S. A. Mountjoy, L.V.Sc., Veterinary Officer.]

BEE-KEEPING NOTES

Fantastic reports concerning the distance from the hive that bees will successfully gather nectar are frequently heard and in normal seasons honey-dew, a secretion sometimes exuded from the young growth of trees and gathered by the bees within a reasonable distance from the hive, has occasionally deluded bee-keepers into believing that their bees were working on the nearest blossom many miles away. In years of drought when the possibility of securing pollen and nectar by the bees is reduced to a minimum, the writer has frequently inspected starving bees within five miles of a supply of both pollen and nectar.

* * * * *

Swarming is an instinct of the bees, and nature's method of providing an increase, consequently this cannot be entirely prevented, but in the hands of experienced bee-keepers can be reasonably controlled, mainly by using young queens bred from stock selected for reduced swarming instincts, and by allowing surplus breeding space during spring, when the swarming urge is most prevalent.

Under favourable conditions, in an apiary containing queens of various ages, the interchanging of the upper and lower brood chambers unless completely reversed, as in the Bolton method to destroy the embryo queens in the cells, may not prevent swarming.

In selecting a site for the apiary, shelter from strong winds is essential. Unless driven down by strong winds, bees usually fly high and straight to and from the hives.

[J. W. Thomlinson, Apiary Inspector.]

By GEORGE HYAM, *Horticultural Supervisor.*

THE mushroom crop on many of our farms is well worth harvesting, and will show a good return if properly harvested, graded and packed for market. Large quantities of mushrooms sent to market, however, often become a total loss or return very low prices because of neglect by consignors to pay attention to these details.

Of the 20,000 recorded species of the higher fungi, there are only two which come under the popular description of "mushrooms". The common Field Mushroom (*Psalliota* or *Agaricus campestris*) is the species most sought after, but its near relative the Horse Mushroom (*P. arvensis*) is also quite edible, and is frequently eaten here, in spite of its relatively inferior flavour.

Both of these edible mushrooms are included in the genera *Agaricaceae*, of which there are at least 120 common species found in Victoria.(1) Most of these are inedible, but few are dangerous, and the really poisonous kinds in this genus are seldom found in Australia. But anyone intending to collect and market wild mushrooms should know how to identify the two edible kinds, and to separate the field mushroom from the horse mushroom. If these two kinds are mixed in the cases, selling value of the whole is greatly reduced, and a preponderance of the horse mushroom would render the whole case unsaleable, if the market is well supplied.

The horse and the field mushroom are not difficult to identify, and are easily distinguishable from the less edible or dangerous kinds. In the case of these latter, however, many of the traditional "tests" of edibility are not reliable. It is best not to rely too much on such tests as ease in peeling, certain odours, blackening of silver utensils, &c., but rather on certain features of the true mushroom which are given in detail hereunder.

Features of the True Field Mushroom

Reject all gilled fungi with highly-coloured caps, or conical in shape, or with coarse, dark scales on the cap. This will eliminate most of the inedible kinds. Then look for the following characteristics of the true field mushroom.

Size and shape are variable, but the caps are either convex or flattened with skins that range from a smooth, silvery-white in their young stage, to a somewhat scaly, reddish-brown, when older. This mushroom can be distinguished from allied members of the same genus by the colour of the gills,

Left.—"Button" mushroom, the "veil" completely encasing the gills. Centre.—"Cup" mushroom, veil broken. Right.—"Open"—gills completely exposed.

which are pale salmon-pink, even at a very early stage. This colour derives from the millions of spores which are formed between the gills, and as the mushroom matures, these spores gradually deepen in colour until they become a dark chocolate brown. The stalk is white and should be firm and fleshy—not woody or soft and wet—and it is encircled by a clearly-defined ring where the skin or "veil" was attached when the mushroom was in the button stage.

Features of the Horse Mushroom

The horse mushroom may be distinguished by its larger size, which ranges from 4 to 12 inches across, and its cap is higher and domed like a cottage loaf. The colour of its cap is also silvery-white but often has a yellow tint. The gills are white or greyish when young, and also become a reddish-chocolate colour when mature, but do not pass through a pink stage. The stem is stout and bulbous and is encircled with a prominent double-layered ring instead of the less conspicuous single ring of the field mushroom. This often cracks into definite scales. The odour of the horse mushroom resembles that of newly-ground meal and thus differs from the true mushroom odour of the field mushroom.

The pith of the stem and cap is thick and rather tasteless and is inclined to be indigestible.

How Mushrooms Grow

Both field and horse mushrooms are found in temperate climates all over the world, and their life-cycle is that of all fungi—large or microscopic. There are three stages, spores, mycelium (or spawn) and the mushroom itself, the latter being the fruiting body which develops the spores for future generations. Each mushroom produces millions of spores which are smaller than the finest dust. Under natural conditions these minute bodies are thrown off and carried by the wind on to nearby herbage. When this is eaten by stock, the spores pass out with the dung and will germinate in favorable weather. Other spores falling upon decaying matter on the ground may

Horse mushrooms have little market value and should not be included in the same case with field mushrooms. These specimens are, respectively, 11 inches and 9½ inches in diameter. [Herald photo.]

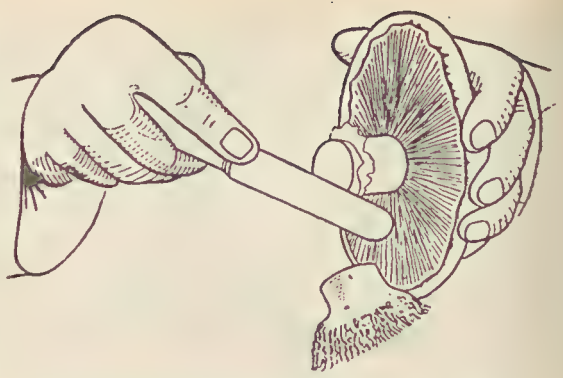
also germinate. The spores develop into underground threads, the mycelium, which spread for considerable distances, lying dormant until the proper degrees of temperature and humidity occur to enable them to develop mushrooms. Thus, it is only after rain and at fairly high soil temperatures that mushrooms appear in the paddocks.

Mushrooms need cellulose and lignin in a partially decayed form for their development and this is found in an ideal state in animal droppings.

The best crops of mushrooms are usually found in grass paddocks that have been well stocked, and have not been ploughed for some time. They multiply rapidly, but are kept in check or maybe eliminated entirely by other soil fungi which prey upon them, and this is often the cause of once good mushroom paddocks failing to produce their onetime large crops of mushrooms. In time, the cycle will come round again and mushrooms will re-appear in predominant quantity, if the sod is undisturbed.

Exploiting Field Mushrooms for the Market

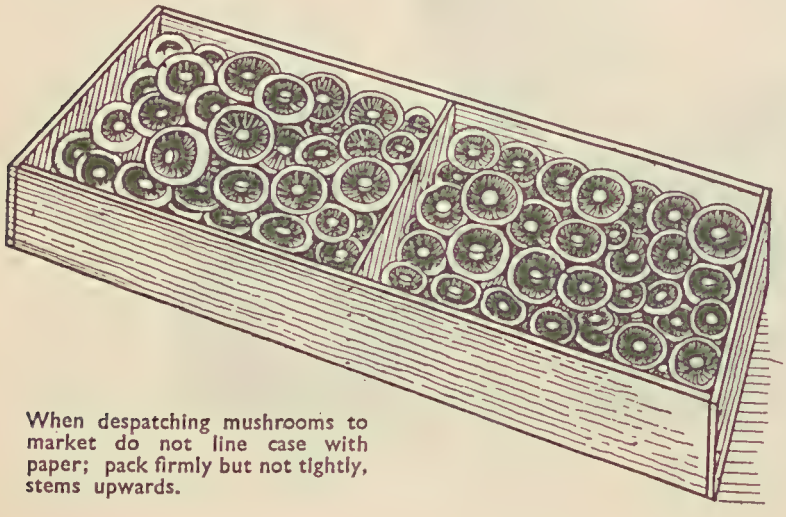
The best mushroom country is in districts where there is a high rainfall in the spring, and where early autumn rains occur, but good crops are found in other districts where similar weather conditions prevail from time to time. Mushrooms of best quality generally come from paddocks having a friable soil, so that the mushroom comes through the surface without a check. Hard top soils cause distortion, and the mushrooms



Stems should be cut about one inch from gills at time of picking to avoid dirt falling into the gills.

are often well matured before they come through. They mostly break the surface during the night, so for quality, early morning picking is desirable. If left too long after they have emerged, they can be damaged by insects, birds, or grazing stock, and soon lose their freshness and colour by prolonged exposure to the light. In good seasons the paddocks should be gone over at least twice daily.

By attention to quality—which means nice white-capped and pink-gilled mushrooms—the harvesting of a field crop can produce a good return if the yield is worth while. There is always a big margin between the highest and lowest prices for mushrooms on the market, so that the aim should be for the best grades. Quality can be spoilt by bad picking. Mushrooms should always be pulled up with the unbroken stem attached and should be carried in a bucket or box—never in a bag. They should be placed in the container with their stems uppermost, and it is better to cut off the stem an inch or so from the cap before placing the mushroom in the receptacle, to avoid any soil or sand falling on to the gills and making them gritty.



When despatching mushrooms to market do not line case with paper; pack firmly but not tightly, stems upwards.

Packing and Grading for Market

Mushrooms arrive in Melbourne in all kinds of packages ranging from

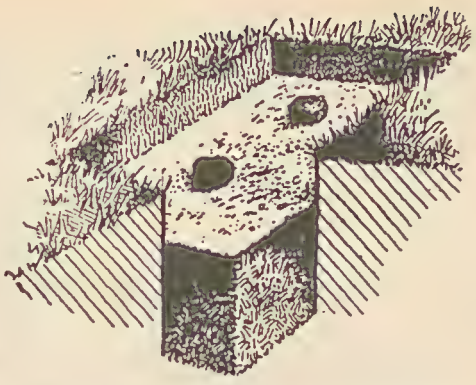
cardboard boxes to kerosene tins, with the result that large quantities go to the tip as unsaleable on account of breakage, sweat, and decay. Many consignments arrive without the least attempt having been made to grade for size, quality, or age, and these mixed lines bring a low price. If graded, however, a large proportion might have been sold at top prices. Others are held for a day or two before forwarding, and are stale before they reach the shops. Lack of attention to these points causes disappointment in the returns received for mushrooms. The mushrooms probably looked well enough when despatched, but bad packing will often cause deterioration when the mushrooms are in transit.

Mushrooms should first be sorted into three grades—" buttons " with the veil still enclosing the gills ; " cups ", with the edges of the cap curled over ; and " open " with gills fully exposed. Any horse mushrooms that have been inadvertently picked should be rejected. Lightly brush off any soil with a pad of cotton wool. Dirty and broken mushrooms are not sought after. If the quantity warrants it, grade to size also.

The best market package is the " flat bushel " fruit case divided in the centre. Such cases can be obtained second hand from any fruiterer. Lay the case on the flat and prise off the side boards. Pack the mushrooms in rows, stem upward, just tight enough to prevent movement. If picked in the rain, allow to dry before packing. Do not line the cases with paper as mushrooms must have air circulating round them or they will sweat in the course of a few hours. Remove any old brands on the case and stencil the net weight and grade, and the agent's brand on the ends with the words " Mushrooms—Perishable " on the side or top. The bushel case will hold about 24 lb. " button ", 20 lb. of " cups " and 15 to 17 lb. of " open grade ". The half-bushel tomato or cherry box is suitable for smaller quantities and is packed in the same way. Despatch by the first available passenger train ; goods trains are usually too slow ; and it is advisable to advise the agent by phone or telegram when mushrooms are being forwarded so that they may be picked up promptly.

Introducing Mushrooms to a Pasture

It is quite possible to introduce mushrooms into a suitable paddock by spawning, particularly if the paddock has produced some mushrooms before. This is done by lifting squares of turf and digging out the soil to a depth of 10 to 12 inches and filling the hole with fresh horse manure to a depth of 6 to 8 inches when rammed down. Pieces of spawn are placed on top of this manure which is covered with 2 or 3 inches of soil before the turf is replaced. The turf should be rammed down firmly to bring it to the original level.



Section of hole dug in a pasture for the introduction of mushroom spawn. For details, see " Introducing Mushrooms to a Pasture ", this page.

Spawning is best done about two or three months before the usual time for flushes of mushrooms in the district, but these crops are just as dependent on weather conditions as are naturally-grown mushrooms. This method is used extensively in England where the season is short but reliable. Under Victorian conditions, its economy for market mushrooms is doubtful, except perhaps in favoured districts. Spawn is fairly expensive, but Australian-raised spawn is quite reliable and, where soil and climatic conditions are good, a light spawning will spread and will probably revive a once good mushroom paddock which has been worked out through cultivation or perhaps by a parasitic fungus preying on the original mycelium.

Artificial Culture

The artificial culture of mushrooms does not come within the scope of this article, but it can be said that it is a highly technical branch of horticulture, needing much skill in preparation of the beds, an abundant supply of stable manure, a fairly high capital expenditure on sheds, and the ability

to control and eradicate the many parasitic fungi and insects which tend to infest beds devoted entirely to mushrooms even more than mushrooms grown in the field. For large scale production, sufficient to provide a living, mushroom culture is by no means as easy as some propaganda would suggest.

Reference

1. "*Victorian Fungi*", by J. H. Willis, Field Naturalists Club of Victoria.

Accredited Brucellosis-free Herds (Swine)

The following herds of pigs have been accredited as free of swine brucellosis (contagious abortion of pigs) by the Department of Agriculture.

An accredited brucellosis-free herd of pigs is one in which all animals therein have been subjected to two successive blood tests for brucellosis with negative results at intervals prescribed by the Chief Veterinary Inspector of the Department.

In order to remain accredited, a semi-final or annual re-test (as determined by the Chief Veterinary Inspector) of all animals in the herd shall be conducted. If, at a re-test, any animal fails to give a negative reaction to the test, the herd shall not be declared brucellosis-free again until two tests of the complete herd have been carried out with negative results.

Full particulars of the Accredited Swine Brucellosis-free Herd Scheme and application forms may be obtained from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Name.	Address.	Name.	Address.
Abrahams, L. J. ..	Red Hill South	Harrison, C. T. ..	"Eastside," Pomborneit
Anderson, W. Harvie ..	"Merrileugh, Inverloch	Hawtin, I. E. and F. ..	"Rossmoyne," Colac
Baker, J. J.	Bannockburn	Haywood, Dr. A. R. ..	Hastings
Barclay, F.	Tyabb	Haywood, G. T. B. ..	Cranbourne
Barclay, T. H.	Tyabb	Hodgins, A. S.	Tyabb
Beechy, K.	Pomborneit	Horn, L. A.	Leongatha North
Betts, V. R.	Craig's Lane, Pomborneit	Jackson, Wm. C. ..	"Patterdale" Stud, Main Ridge
Bidgood Bros.	Wodonga	James, W. E.	Templestowe
Bodey, A. A.	"Bonnyview," Dooen	Jephson, W. T. ..	Stacey's Bridge
Bright, George H. ..	Dumbalk	Lacey, S. T.	Main Ridge
Buller, R. A.	Beaconsfield	Longerenong College ..	Dooen
Cash, I. M., and Sons ..	Jindivick	Mackenzie, A. S. ..	Upper Beaconsfield
Castle, L. H.	Clarinda	Marriott, F. C.	Bentleigh East
Chapple, S. T.	Rye	Marshman, A. D. ..	Archie's Creek
Chisholm, R. J. ..	Archie's Creek	Miller, A. J.	"Glenvale," Whittlesea
Coates, R. J. H. ..	Corangamite	Mundy Bros.	Orbost
Cornell, J.	Wheeler's Hill	Myers, F. P.	Bittern
Cox, H. H.	Jacaranda Stud, Leopold	Noble, T. M., and Sons ..	Maffra
Critten, H. S.	Dumbalk	Northcote Children's Farm	Bacchus Marsh
Devine, Herbert ..	Swan Marsh	Peters, W. H.	Heatherton
Dingwall, A. E. ..	Maffra	Petersen, E. V. ..	Korumburra
Dookie Agricultural College	Dookie	Richards, Albert H. ..	Dumbalk, via Meeniyan
Doornbusch, John L. ..	"Starpark," Nhill	Rintoul, J. T. C. ..	Glengarry
Dougall, J. K.	Hastings	Roy, W. A.	Morrell's Hill, via Boolarra
Dowie, Alexander ..	Mt. Moriac	Sexton, John	Swan Marsh
Doyle, G., Dr.	Arthur's Creek	Simpson, Ronald D. ..	Birregurra
Dunstan, John	Tomahawk Creek	State Experiment Farm ..	Rutherglen
Ellwood, A. H. ..	Paschendaele	Trenery and Soderlund ..	"Promview," Foster
Fairchild and Clutterbuck	Tinamba	Trigg, A. J.	Bungaree
Garry, Thos. E. ..	Kernot	Trigg, N. H.	Bullarook
Goding Bros.	Moorooduc	Tweddle, J. T.	"Winlaton." Shepparton
Greig, J. F., and I. S. ..	Gnotuk	Warry, A., and Sons ..	Delburn
Hamblin, A. T., and Sons	Toolleen	Whelpton, B.	Whittlesea North
Hardinge, B., and Sons ..	Nar Nar Goon	White, G. W.	Boolarra South
Harris, Clement C. ..	"Egerton Villa," Loch		

MALLEE RESEARCH STATION

Experimental Work and Results

By OFFICERS OF THE STATION

The first portion of this article, dealing with experiments on wheat, appeared in the September issue of the Journal.

OATS

OATS occupy a larger area in the Mallee than is generally recognized, the average annual area sown over the last ten years being 340,000 acres, compared with approximately 1,231,000 acres of wheat.

Oat crops in the Mallee are usually sown on stubble land, without any preliminary preparation of the soil. Under these conditions fair crops may be grown in a normal season, but it is a wise procedure, particularly if fodder reserves on the farm are low, to sow at least part of the area devoted to oats on fallow land each year.

Oats may be cut for hay, stripped for grain or fed off to stock. The proportion of the oat crop used for each of the above purposes varies according to seasonal conditions. Oats as hay or grain form a very suitable fodder reserve on Mallee farms. For many years past, increasing areas of oats have been sown with the object of providing feed for sheep during the winter and early spring months. For this purpose they have proved very satisfactory, providing more feed at that time of the year than do natural or any of the sown pastures at present available. Some varieties of oats show high powers of recovery, particularly for a grain yield, after such grazing.

Oat Variety Trials

In the fourteen years since the inception of the Station, a large number of oat varieties has been tested. These are set out in the order in which they mature:—

Early maturing.—Palestine, Gidgee. Mulga, Belar, Early Kherson. Burke, Wongan, Burt's Early.
Mid-season maturing.—Fulghum, Dawn. Guyra, Kareela, Ideal.
Late maturing.—Lachlan, Algeribee. Algerian, New Zealand Cape.

Experience has shown that it is desirable to sow more than one variety of oats each year to enable maximum advantage to be taken of seasonal conditions. Also, it enables the oat harvest to be spread over a longer period and reduces the risk of loss of grain due to winds at harvest time. In those years when late rains are not experienced, the earlier maturing varieties will give better yields than the late variety, Algerian. There is little doubt that larger areas of the early varieties of oats could be sown with advantage in the Mallee, particularly in the northern portions.

There are twelve varieties of oats including crossbreds and selections in the main oat variety trials this season. These are sown on fallow for hay yields and on stubble land for both hay and grain. In addition, other sections of these plots on stubble are devoted to grazing. Tests are made to determine the ability of each variety to recover and give a satisfactory grain yield after being grazed off in July, and also to measure the amount of grazing provided by each variety when used solely as a grazing crop. Many other varieties are tested in "Junior" trials, where only hay and grain (ungrazed) comparisons are made.

The results of the main oat variety trial, ungrazed section, are shown in Table 14.

TABLE 14.—OAT VARIETY TRIALS IN THE MALLEE.

Variety.	Hay Yields.					Grain Yields.			
	Sown on Stubble.		Sown on Fallow.			Sown on Stubble.		Sown on Fallow.	
	Walpeup.		Walpeup.	Woomelang.	Ultima.	Walpeup.		Woomelang.	Ultima.
	Average 8 years, 1938–45.	Average 14 years, 1932–45.	Average 6 years, 1940–45.	Average 4 years, 1942–45.	Average 3 years, 1943–45.	Average 8 years, 1938–45.	Average 12 years, 1934–45.	Average 5 years, 1941–45.	Average 3 years, 1943–45.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.	bus./ac.	bus./ac.	bus./ac.	bus./ac.
Dawn	15.0	19.7	21.2	16.4	8.2	12.2	13.6	10.7	10.3
Mulga	15.0	19.0	21.5	22.8	7.2	13.0	14.1	9.9	10.3
Algerian	14.2	18.3	17.8	16.8	8.0	12.2	13.9	9.8	10.2
Algoribee	15.3	..	19.6	17.3	8.9	12.4	..	11.1	10.4
Palestine x Dawn R4–1–1 ..	14.5	..	20.2	20.7	6.5	14.8	..	13.3	13.0
Fulghum	13.9	..	19.6	17.9	7.9	12.6	..	10.1	11.9

It will be seen that the earlier maturing varieties, Mulga and Dawn, have given higher yields of hay than Algerian. Algeribee, a selection from Algerian has also outyielded its parent, and most other varieties as well over the period it has been tested. The sowing by farmers of larger areas of this variety is warranted.

In respect to grain yields, there is little difference between the standard varieties over a period of years, although there are large annual differences due to the seasonal conditions prevailing. Highest yields of grain have been obtained from the crossbred Palestine x Dawn R4–1–1.

Rate of Seeding Trials with Oats

During the years 1933–37, rate of seeding trials were sown with Mulga, Algerian, and Dawn varieties. Prior to 1935, hay yields only were obtained, but for the remainder of the period, grain yields were also included in the tests.

In later years, the rate of seeding trial was incorporated in the main oat variety trial sown on stubble land, and information was provided as to the most desirable seeding rates for the various varieties of oats when sown for hay, grain, or grazing. Varieties differ in the size of their grain, and also in the size of grain from year to year. In these tests the seeding rates were adjusted to give a comparable number of plants per foot of each variety for each seeding rate. The results obtained during the four years 1938–41 are shown in Table 16. The yields shown for each rate of seeding are the average for all varieties included in the variety trials.

TABLE 15.—RATE OF SEEDING TRIALS. OATS ON STUBBLE.

Hay Section—Cwt. per Acre.

Rate of Seeding.	Average Five Years, 1933–37, Algerian.	Average Four Years, 1933–36, Mulga.	1937, Dawn.
30 lb. per acre ..	21·5	18·3	17·3
50 lb. per acre ..	22·0	19·9	17·7
70 lb. per acre ..	23·1	19·5	18·2

Grain Section—Bus. per Acre.

Rate of Seeding.	Average Three Years, 1935–37, Algerian.	Average Two Years, 1935–36, Mulga.	1937, Dawn.
30 lb. per acre ..	14·3	16·4	13·2
50 lb. per acre ..	15·2	15·0	14·4
70 lb. per acre ..	15·8	15·6	14·1

A seeding of 50 lb. of seed per acre is usually regarded as a satisfactory seeding rate for oats sown on stubble land in the Mallee and the above results show that the heavier sowings have given only slightly greater yields of both hay and grain. However, other detailed studies have proved that, as might be expected, much more feed is given by the heavier

Oat variety plots at the Mallee Research Station.

TABLE 16.—OAT RATE OF SEEDING TRIALS (ON STUBBLE LAND).

Average Yield, all Varieties Tested, Four Years 1938–41.

Rate of Seeding.	Hay Yield.	Grain Yield.	
		Ungrazed.	Grazed Once.
	cwt./ac.	bus./ac.	bus./ac.
Approx. 30 lb. per acre (equivalent to 5½ grains per foot)	19·3	17·8	8·5
Approx. 60 lb. per acre (equivalent to 11 grains per foot)	19.8	18·5	9·7
Approx. 90 lb. per acre (equivalent to 16½ grains per foot)	19·9	19·0	9·8

sowings when it is desired to feed off the crop. (See Table 22.)

Because of the upright early growth and sparse stooling habits of the early and mid-season varieties, it is natural to consider that they should be sown considerably heavier than Algerian. Tests have not substantiated this belief, as it has been found that Algerian responds to heavier seeding in much the same way as Mulga.

Manurial Trials with Oats

Tests have been sown to determine the effect of various applications of superphosphate, and super. and ammonia fertilizer mixtures. This experiment, which was sown with Mulga oats on wheaten stubble ground, has shown that small increases of hay can be obtained by the use of super. and ammonia mixtures in this district, but so far the increases have not been sufficiently large to pay for the cost of the fertilizer.

Results obtained show that the use of more than 30 to 40 lb. of superphosphate per acre with oats on stubble is not justified.

TABLE 17.—OAT MANURIAL TESTS (ON STUBBLE LAND), AVERAGE SIX YEARS, 1934–39.

Treatment.	Yield.
	Cwt. Per Acre.
No manure	17·1
Super., 30 lb. per acre	18·1
Super., 60 lb. per acre	18·5
Super., 30 lb., ammonium sulphate, 30 lb. per acre	18·6
Super., 60 lb., ammonium sulphate, 30 lb. per acre	19·9
Super., 60 lb., ammonium sulphate, 60 lb. per acre	20·3

It will be seen that the response of oats to superphosphate on stubble land is similar to that of wheat (see Table 9).

To determine if the superphosphate sown with the preceding wheat crop has any beneficial effect on stubble sown oats, plots were sown in each of five years, without manure on the site of the wheat manurial trial in the preceding year. In this manner the residual effect on oats from the application of 30, 60, 90, and 120 lb. of superphosphate to the wheat crop was determined.

The results obtained from this trial are shown in Table 18.

TABLE 18.—RESIDUAL MANURIAL TRIAL (OATS ON WHEAT STUBBLE LAND), AVERAGE FIVE YEARS, 1937–41.

Treatment. Wheat in the Previous Year.	Oats, 1937–41.
	Cwt. Per Acre.
No manure	21·1
Super., 30 lb. per acre	22·7
Super., 60 lb. per acre	23·3
Super., 90 lb. per acre	24·0
Super., 120 lb. per acre	25·4

It will be seen that superphosphate applied with the wheat on fallow also has a beneficial effect on the subsequent stubble crop, the greater benefits being derived from the heavier dressings.

In addition to the above tests on stubble ground a series of oat plots for hay has been sown to test the effect of super. on this crop when sown on fallowed land.

The results show that when oats are sown on fallowed land they give a marked response to superphosphate.

TABLE 19.—OAT MANURIAL TRIAL ON FALLOW.

Treatment.	Mulga. Average, Six Years, 1937–41 and 1945.	Algerian. Average, Three Years, 1938–40.
	cwt./ac.	cwt./ac.
No Manure	25·1	18·6
Super. 30 lb. per acre ..	32·6	21·3
Super., 60 lb. per acre ..	35·6	23·3
Super., 90 lb. per acre ...	37·6	23·7

Oat Grazing Trials

For some years prior to the recent droughts, sheep numbers in the Mallee had been steadily increasing, and most Mallee farmers now regard sheep as a necessary adjunct to their wheatgrowing activities. Unfortunately, native pastures and the grazing obtained from stubbles cannot be relied upon to supply sufficien grazing for the sheep at all times of the year—particularly if it is desired to market fat lambs. All things considered, oats appear to offer the best fodder to sow to supplement the natural feed.

In 1935, experiments were commenced at the Mallee Research Station, Walpeup, with the object of determining the comparative suitability of oat varieties for grazing, for either portion or the whole of their growing period.

The green feed produced by the varieties under test was determined by cutting and weighing samples, and the number of sheep carried on the various plots was also recorded.

Oats for grazing should be sown as early in the season as possible. If sown dry, they can come away with the first rains and provide early winter feed.

To compare the amount of grazing provided by the three principal varieties when sown on stubble land, without manure, for grazing throughout the season, a comprehensive test at equivalent thicknesses of seeding, ranging from 50 to 60 lb. per acre, was conducted over a period of three years.

Three 1-acre plots of each variety were sown with the combine in April, the feed produced being fed off throughout the growing period by sheep grazing on one plot of each variety simultaneously, and then moving to the second and third series in rotation. The number of sheep used at each grazing was adjusted to the feed available, and a record kept of the number of sheep-days (number of sheep multiplied by days of grazing) for each plot of each variety. The dates and times of grazing varied with the seasonal conditions, but each plot was grazed at least four times from July to November. The results of this experiment and more recent tests have shown that the early maturing upright growing type of oats, e.g., Mulga or Gidgee give the most feed early in the season, and that the later varieties, such as Algeribee or Algerian give a better recovery after the early grazings and provide more feed at the later grazings. Varieties of midseason maturity such as Dawn give a more even

spread of grazing throughout the year.

In a normal year, the value of feed is greatest in the winter, but green feed in November, after the native grasses have gone to seed, is very useful for late lambs. It is desirable not to rely solely on one oat variety for complete grazing, but to sow more than one variety to get maximum production at the various periods of the season. This may be done by sowing separate areas of each variety, or by mixing the seed prior to sowing. When grazing, the best plan is to fence the oats into conveniently sized paddocks, and to feed off each in rotation, resting them until a sufficient re-growth for grazing is made. Grazing at approximately monthly periods should be possible.

Oat variety grazing trials—left, ungrazed; right, grazed.

TABLE 20.—OATS FOR COMPLETE GRAZING.

Greenstuff at different periods of the year, yields in cwts. per acre. 80 per cent. moisture. Average 4 years, 1942–45.

Variety.	First Grazing, July.	Second Grazing, Early Sept.	Third Grazing, October.	Total All Grazings.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt./ac.
Mulga	8·5	5·9	5·6	20·0
Palestine x Dawn R4–1–1 ..	6·9	6·9	7·4	21·2
Dawn	7·7	6·1	6·7	20·5
Fulghum ..	7·4	6·7	8·1	22·2
Belar	6·9	5·8	6·2	19·0
Algeribee ..	6·6	6·3	6·6	19·4
Algerian ..	6·0	7·2	7·3	20·4

As grazing may be carried out over part of the growing period only, a comparison of the amounts of early green-feed produced, and the ability of the different varieties to recover and produce grain is important.

It has now been adopted as a standard practice in the experimental plots that one section of the oat variety trial on stubble should be grazed in July, and the subsequent recovery yield of grain recorded. Results of this trial are given in Table 21.

TABLE 21.—RECOVERY OF OATS AFTER GRAZING.

Average Yield, 8 Years, 1938–45.

Variety.	Average Weight Greenstuff, July.	Grain Yields.	
		Ungrazed.	Grazed Once.
	cwt./ac.	bus./ac.	bus. ac.
Mulga	13·3	13·0	6·0
Palestine x Dawn R4–1–1 ..	12·8	14·8	8·7
Fulghum ..	12·6	12·6	8·9
Dawn	12·8	12·2	6·5
Algeribee ..	11·7	12·4	6·7
Algerian	10·6	12·2	6·9

The varieties in Table 21 are arranged in their normal order of maturity. It will be seen that the early and mid-season varieties have produced the greatest amounts of green-feed at the grazing in July. Also that the subsequent grain yield of all varieties tested is seriously reduced by grazing. The varieties Palestine x Dawn R4–1–1, and Fulghum show up to advantage in this direction. An examination of the yields obtained in individual years and the incidence of the rainfall shows the importance of the spring rains in determining the recovery after grazing. If good late rains are received,

the later-maturing varieties recover much better than the early types, but in the absence of such rains the yield reductions as a result of feeding-off are just as great in the late as in the early varieties.

A factor of importance in determining the recovery of oats after grazing is the habit of growth of the plant. There are two distinct phases in the growth of cereal plants, the grassy or rosette stage, and the upright or reproductive stage. Grazing a crop in the grassy stage does not affect the main stools, but this grazing should be discontinued when the plant begins upright or stemmy growth: with oats sown early in May this occurs about the end of July for early varieties at Walpeup, and about a month later for Algerian. It has been found that even among varieties that ripen at the same time, there are big differences in the length of the grassy stage. Fulghum and Dawn, if ungrazed, ripen at approximately the same time, but Fulghum commences upright growth nearly a fortnight later than Dawn. It has been found that the grain yield of Fulghum is less affected by grazing than that of Dawn. A similar comparison can be made between Mulga and Palestine x Dawn R4–1–1 as this crossbred also has a long grassy stage and a short post-jointing stage.

When an oat crop is being sown for the purpose of grazing to stock, much more feed is obtained if heavy rates of seeding are adopted. This is well illustrated by the figures in Table 22 which gives the average weights of green-stuff obtained by sampling the rate of seeding trials in July. The yields given are the average weights of all the varieties tested and confirm the results obtained in earlier tests where Mulga and Algerian were the only varieties tested.

TABLE 22.—YIELDS OF GREEN-STUFF.

Oat Rate of Seeding Trial, Average 4 Years, 1938–41.

Approx. Rate of Seeding; lb. per acre.	Yield of Greenstuff; cwt. per acre.
30 (5½ grains per ft.)	13·6
60 (11 grains per ft.)	15·8
90 (16½ grains per ft.)	20·1

From the table, it is seen that oats grown with the object of feeding-off should be sown thicker than normal. Rates of up to 70 lb. per acre may be applied with advantage in such cases. If the season turns out to be so favourable that grazing of the oat crop is unnecessary, no loss, and probably a gain will result from the heavier seeding.

There are large variations in the size of the grain of different oat varieties. This factor should be borne in mind when deciding the seeding rate to be adopted. For example, the grain of Fulghum is approximately 20 per cent. smaller than that of Dawn, and to give comparable seeding rates, Dawn would be sown at 60 lb. and Fulghum at 47 lb. of seed per acre.

Experiments have shown that the use of manures with oats on stubble have increased the amount of grazing. Superphosphate and ammonia mixtures have given greater increases than superphosphate alone—but owing to the cost of these fertilizers, their use to increase the amount of grazing is not justified under Mallee conditions.

Other Cereals for Grazing

Throughout these investigations, the fact that other cereals may give more grazing than oats was not ignored. There are, however, many advantages accruing from the use of oats in the Mallee. Oats are a good rotation crop with wheat, as they are resistant to many wheat diseases, while, in a good year, they provide either a good hay or grain crop if allowed to recover after an early grazing. Barley is susceptible to the root-rot diseases of wheat, and for this reason is not a very suitable rotation crop where these diseases are troublesome. Rye has a reputation for growing well under difficult conditions, as regards soil and climate. It will make much more growth than other cereals on light land affected by wind erosion in the Mallee.

The average yields of green-stuff obtained from the various cereals for the four years, 1937 to 1940, are shown in Table 23.

Rye has outyielded other cereals for total green fodder. While the winter feed from rye is quite satisfactory and is

readily eaten by stock, the growth in the spring is coarse and stemmy and not so palatable as oats. Rye does not make a really good hay. The variety of rye commonly grown in Victoria is Black Winter, but a strain obtained from South Australia makes more early growth.

TABLE 23.—YIELD OF GREENSTUFF FROM VARIOUS CEREALS.

Average 3 Years, 1939–41. Moisture 80 Per Cent.

Variety.	First Grazing, July.	Second Grazing, Early Sept.	Third Grazing, October.	Total Grazing.
	cwt./ac.	cwt./ac.	cwt./ac.	cwt. ac.
Dawn Oats ..	10·0	11·6	14·3	35·9
Cape Barley ..	7·9	10·9	18·4	37·2
Ranee 4H Wheat	8·5	9·9	15·9	34·3
Black Winter Rye	11·0	13·8	18·5	43·3
South Australian Rye ..	12·4	11·6	18·2	42·2
Average 6 Years, 1939–41 and 1943–45.				
Dawn Oats ..	8·8	8·8	10·1	27·7
South Australian Rye ..	9·6	8·9	11·8	30·3

Mixtures of cereals, or of early and late varieties of oats have proved very satisfactory for grazing, and give a better "spread" of the grazing throughout the year.

Oat Diseases

Under Mallee conditions, oats are apparently not susceptible to many diseases. The most common root disease is purple patch (*Rhizoctonia solani*), but usually the patches attacked are fairly small.

Smuts are the most common diseases encountered. There are two types of smut commonly found in oats—known respectively as Loose Smut and Covered Smut. Of these, loose smut is the more common. The best methods of control are—

(*a*) The use of clean seed wherever possible.

(*b*) The use of pickling methods similar to those for wheat.

The mercurial pickles are more effective in controlling oat smuts than copper compounds. Some varieties of oats are resistant to both types of smut. Resistant varieties include Belar, Burt's Early, Fulghum, and Guyra.

BARLEY

The average area sown to barley in the Mallee during the last five pre-war years was 34,000 acres. This area, which represents approximately 23 per cent. of the total sown to barley in Victoria, returned about 16 per cent. of the State's yield of this cereal. The acreage sown has varied considerably during recent years. In some seasons a satisfactory malting sample of barley is grown in the Mallee, but in dry years the grain produced is used mainly for feeding purposes. Most of the sowings of barley in the Mallee are made in the south-western part, namely, Rainbow, Beulah, and Hopetoun districts.

Variety trials have been conducted at Walpeup to compare the newer varieties and crossbreds for Mallee conditions. Results of this trial are shown in Table 24. Barley has also been tested for its ability to produce green feed (see Table 23) and is included in certain rotations of the Rotation Trials.

TABLE 24.—BARLEY YIELD TRIAL.

Variety.	Average, Two Years, 1940–41.	Average, Three Years, 1939–41.
	bus./ac.	bus./ac.
Cape	30·7	26·8
Sea of Azov	28·9	..
Vaughan	28·4	..
Atlas	26·4	..
Pryor	25·2	22·4
Research	24·2	21·2

FIELD PEAS

Where peas can be grown satisfactorily they provide a useful crop which can be harvested for grain or used as a fodder either as a green crop or after maturity. Like other legumes, they are of value in building up the nitrogen in the soil.

The tests at this Station have been for grain only, and in addition to obtaining information regarding the yielding ability of standard varieties, they have included the testing of crossbreds and new varieties, many of which have come from overseas. This latter work is being done in

co-operation with the Melbourne University School of Agriculture.

During the last seven years, the peas failed to set seed in three of those years, namely 1940, 1943, and 1944. Over the seven-year period White Brunswick peas have averaged 8.6 bushels per acre, while Duns have yielded 7.8 bushels per acre. Over a five-year period the yields have been, White Brunswick 9.0 bushels, Collegian (a new variety from Roseworthy College) 8.4 bushels, and Dun 8.1 bushels per acre.

The yields of pea plots have been lower each year than wheat plots in the same paddock. It is thought that the yield of peas would be approximately half that of wheat sown under similar conditions. Peas do not have the same suppressive effect on weeds as do cereals, and in most years the peas have serious competition from mustard, and harvesting is thus made more difficult.

LINSEED.

Test plots of linseed were sown during the years 1941–45, to obtain information regarding the possibility of growing this plant, the seed of which yields oil and protein.

The experience has been that linseed is unable to compete with weeds which cereals would normally suppress. Linseed in the plots was practically crowded out by mustard and other weeds in the spring, while plots of Ranee 4H wheat in the same section kept above the weeds and matured quite a good crop. In 1941, the Ranee 4H check yielded 22 bushels, while the best yield obtained from linseed was 4 bushels. In 1943, the comparison was wheat 26 bushels and linseed 6 bushels, while in 1944 and 1945, the linseed was a failure and the wheat yielded 6 and 15 bushels respectively. The varieties of linseed that gave the highest yields were Walsh and two strains from Uruguay.

CROP ROTATION TESTS

During the early years of wheatgrowing in the Mallee, intensive cropping with wheat was undertaken and stubbles were burnt to destroy Mallee shoots. Very few, if any, sheep were carried on the farms and the necessity to sow fodder crops for sheep or to leave land out to grass did not exist. However, the need of some system of crop rotation to maintain soil fertility and protect the soil from wind erosion, was recognized. It soon became evident that the production of wheat under the low rainfall conditions experienced was uncertain unless fallowing was practised.

To obtain more definite information as to the effect of crop rotation on the yield of cereals, and soil fertility, a permanent rotation trial has been commenced in Field No. 1. This trial consists of thirteen rotations, two, three, and four course, replicated four times. The rotations are as follow :—

General view of rotation field at the Mallee Research Station.

Two-course rotations under trial at Walpeup.

Two course—

Wheat, fallow.
Wheat, oats grazed till October then scarified.
Wheat, oats grazed till late summer then scarified.

Three course—

Wheat, oats grazed, fallow.
Wheat, barley, fallow.
Wheat, wheat, fallow.
Wheat, oats for hay, fallow.
Wheat, pasture, fallow.
Wheat, oats for grain, fallow.

Four course—

Wheat, oats for hay, oats fed off, fallow.
Wheat, oats for hay, pasture, fallow.
Wheat, pasture, pasture, fallow.
Barley, fallow, oats for hay, fallow.

In addition to the comparative returns obtained from the various rotations, a survey is made from time to time to determine the incidence of foot-rots, take-all, flag smut, sand drift, and other factors such as grain quality which may be influenced by any particular rotation.

The paddock was cleared in 1932, sown to wheat in 1933, oats 1934, and fallowed in 1935. Prior to clearing, opportunity was taken to carry out an exact survey of the timber and vegetation. A chemical soil survey of the area has also been made. In order to test the uniformity of the soil, the bulk wheat crop, in 1933, was cut into numerous blocks and harvested as a uniformity trial. In 1936, opportunity was again taken to test the natural variation of the soil, the sites of the permanent experiments being laid out in plots of similar size, and all being sown to wheat under the same conditions.

It will be understood that several years elapsed before each plot site completed a full cycle of its rotation, and it was not till 1940 that yields of wheat could be taken. The main comparisons which can be made are as follow:—

In the two-course rotations there is no difference in the average yields obtained from wheat grown on normal fallow, and wheat grown on land sown to oats and grazed until October then short fallowed. However, in those plots where cultivation of the area sown to oats for grazing was delayed until late summer the yield of the subsequent wheat crop has been decreased by two bushels per acre.

There is no significant difference in the yield of wheat between any of the three-course rotations tested. In the four-course rotations the series wheat, pasture, pasture, fallow has given slightly higher yields of

wheat than the wheat, oats for hay, pasture, fallow or wheat, oats for hay, oats fed off, fallow rotations. These two latter rotations do however, provide considerably more stock feed than the other four-course rotation.

Results obtained to date are not sufficient to make accurate comparisons between the two-, three-, and four-course rotations, but the average yield of wheat from all the three-course rotations is approximately two bushels per acre less than that from the four-course rotations.

The rotation field also provides a comparison between the yields of crops grown on fallow and those on stubble for wheat, barley, and oats for hay. In each case the average yield over the past six years of the crop grown on fallow is approximately twice that harvested from stubble land.

A further series of rotation plots has been laid down this year. The object of these is to compare, in larger plots, the effect of leaving land out to grass for a period. The plots are much larger than those in Field No. 1, and it is hoped to make valuable observations on the incidence of soil drift on land so spelled compared with land cropped on a two-course rotation.

The standard of volunteer pastures in the Mallee is not high, and a trial is in progress to obtain information with respect to the proportion of years in which a satisfactory pasture of barrel clover and Wimmera rye grass can be established. Also the growth on these sown pastures is to be compared with the growth on a natural volunteer pasture.

CULTIVATION TRIALS

Cultivation trials were commenced at Walpeup in 1933, the following cultivation systems being tested in duplicate plots :—

(*a*) Deep fallow, ploughed 5 inches, mid-July, cultivated and sheeped in standard manner.

(*b*) Normal fallow, ploughed 2½ inches, mid-July, cultivated and sheeped in standard manner.

(*c*) Late fallow, ploughed 2½ inches, late September, cultivated and sheeped in standard manner.

(*d*) Sheeped fallow, ploughed 2½ inches, mid-July, not cultivated till autumn.

(*e*) Neglected fallow, ploughed 2½ inches, mid-July, neither cultivated nor sheeped (abandoned after three years).

(*f*) Non-fallow, ploughed just before seeding.

The results of the trials for nine years, which include the results obtained from a special series of drift control cultivation trials conducted during the three years 1940–42, are given in Table 25.

TABLE 25.—WHEAT CULTIVATION TRIALS

Average Results, Nine Years, 1934–42.

Treatment.	Yield.
	bus. ac.
Deep fallow	19·9
Normal fallow	19·1
Late fallow	18·4
Sheeped fallow	17·4
Non-fallow	13·2

These plots are sown at the normal seeding time with seed at the rate of 60 lb. per acre and superphosphate at 90 lb. per acre.

In each year a certain amount of soil drifting, due to high winds, took place.

It will be seen from a study of Table 25 that the highest average yields have been obtained from the deep fallow plots This is attributed partly to the fact that, under some conditions, the immediate effects of drifting were less serious on deep than on normal fallow. It would appear, however, that deep ploughing results in less erosion than shallow ploughing only when it succeeds in bringing cloddy or clayey material to the surface.

The yield from the late fallow plots is higher than results of similar experiments at other centres would lead one to expect, and should not be taken as a justification of late fallowing. It is pointed out that weed growth on the plots was rigidly suppressed by sheep prior to ploughing and to an extent which may not be

possible or practicable over large areas on the average farm.

It was noticed also, that when even light land was broken up later in the season, it remained rougher and less liable to drift in the summer months than normally cultivated fallow.

It sometimes happens, if fallowing is delayed till after the winter, that the soil becomes too hard to plough effectively, and the operation has to be delayed until the autumn rains. When this happens, every effort should be made to graze the area as heavily as possible in order to keep weed growth to a minimum. By so doing, the loss in yield of the subsequent crop, due to late fallowing, is minimized. In 1938, the late fallowed plots could not be ploughed until March of the following year. Nevertheless, this short fallow period gave an increase of 4·9 bushels per acre over the non-fallow treatment in the 1939 crop.

The high average yield from the non-fallow treatment, and to some extent from the late fallow plots, is attributed to the fact that in some of the years the plots were located on newly-cleared land where weeds were not troublesome. In 1937, the neglected fallow (neither cultivated nor sheeped) treatment was abandoned, but the comparative results between this and normal fallow, over the three-year period, 1934–36, show the average reduction in yield, due to complete neglect of the fallow, to be 10·8 bushels per acre. During the same period, the average yield from the sheeped, but not fallowed, plots was 7·1 bushels below that from the normal fallow, so demonstrating that if a fallow becomes overgrown with weeds the usual benefits of fallowing are lost. That sheep cannot wholly replace the cultivator on the fallow is shown by the average yield of the sheeped-fallow plot, which is 1.7 bushels per acre less than that from normal fallow in the above tests and 3.3 bushels per acre lower in the results shown in Table 26.

The above trials were concluded in 1942 and additional cultivation trials have been laid down on a permanent site. These trials are replicated and embody eight fallow treatments, viz., deep, normal, intensely worked, late, sheeped, scarified non-fallow (not stubble ploughed), and a treatment in which weeds are controlled till October by means of a scarifier, the area being ploughed as a last cultural operation before the summer.

The results of this trial in the past six years are shown in Table 26.

TABLE 26.—PERMANENT CULTIVATION TRIALS.

Average Results, Six Years, 1940–45.

Treatment.	Yield.
	bus. ac.
Intensely-worked fallow	17·4
Deep fallow	17·4
Fallow scarified early, ploughed late ..	17·1
Normal fallow	16·8
Ploughless (scarifier) fallow	15·8
Late fallow (October)	14·2
Sheeped fallow	13·5
Non fallow	9·8

The above results confirm those from the earlier test shown in Table 25. The treatment in which the fallow is intensely worked, that is, cultivated after every worthwhile rain, has returned the highest average yield of wheat. The treatment in which a scarifier was used instead of a plough for the first working and ploughing as a last working before the summer, was introduced as a drift control measure. The early working keeps the weeds under control, and the late ploughing tends to leave the soil rough over the summer. Yields under this treatment have been very satisfactory, but while useful in reducing drift its use is limited to comparatively small areas.

In 1936, a test was introduced in order to determine the effect on yield of sowing a cereal crop in the spring, on land which has been fallowed and treated in the normal manner up to this time. The crop, which is sown at about 40 lb. of seed per acre late in August or early September depending on rains, is grazed down after the plants have become firmly established, and the roots and remaining stalks are expected to hold the soil till after the summer when the land is again worked and sown in the usual way

First working of a fallow. (Left) With a scarifier. (Right) With a plough.

The results of the test are given in Table 27. Although cover crops were sown in these plots in 1938, germination and growth were so poor that no results are available for the treatment in 1939.

TABLE 27.—EFFECT OF COVER CROP.

—	Wheat Yield in Bushels Per Acre. Average Yields, Five Years, 1937–42.
Bare fallow	18·9
Cover crop fallow (oats) ..	17·6

It will be noted that during the five years of test, the cover crop caused an average reduction in wheat yield of 1·3 bushels per acre. In comparing these treatments it is necessary to offset the value of the feed obtained from the cover crop against the reduction of the wheat yield.

The question of what plant is best to sow for cover crop has been investigated. Cereals have been found to be more effective than peas, rape, millet, or Sudan grass. Oats were found to have the least depressing effect on the subsequent yield of wheat (see Table 28).

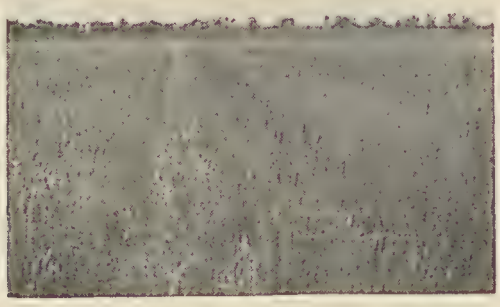
The grazing management of the cover crop is most important. Undergrazing results in a good growth of cover crop and an effective erosion control at the expense of soil moisture, and ultimately, of the wheat yield; while, overgrazing defeats the purpose of sowing the cover crop.

TABLE 28.—YIELD OF WHEAT FOLLOWING DIFFERENT COVER CROPS.

Average Yield of Three Years, 1940–42.

Wheat after—	Yield. Bus. per acre.
Cover crop of oats	15·3
Cover crop of ryecorn ..	14·9
Cover crop of wheat	14·9
Cover crop of barley	14·5
Cover crop of oats, but not grazed till late in growing period	14·4

The concluding instalment of this article will appear in a subsequent issue of the Journal.



BURNLEY EGG-LAYING COMPETITION

Results of Winter Test

By H. F. CLINTON, Poultry Expert

THE thirty-sixth egg-laying competition for fowls, conducted by the Department of Agriculture at the School of Primary Agriculture and Horticulture, Burnley, commenced on 1st April, 1946, and will continue until 2nd March, 1947, a period of 48 weeks.

The winter test, conducted in conjunction with this competition, included the first four months (122 days), and concluded on 31st July last. This test is held annually to give prominence to birds that lay well during this period, when eggs are scarce and prices are high. Certificates are awarded for the greatest number of first-grade eggs laid by individual birds in all classes, provided a bird lays 60 first-grade eggs. It is notable that 56 per cent. of the competition birds laid 60 eggs or more. During the first two months, a first-grade egg must weigh not less than $1\frac{3}{4}$ oz., and thereafter not less than 2 oz.

As was the case last year, the eggs aid by the prize-winning birds were mostly all first-grade. Some very high scores were recorded. In the 122 days of the test, six White Leghorns and fourteen Australorps each laid 100 first-grade eggs or more, twice the number of birds that laid this number of eggs in last year's competition, and in all classes of the competition, 29 other birds each laid 90 first-grade eggs or more. The highest number of first-grade eggs laid by a bird in all classes of the competition was recorded by a White Leghorn entered by Miss A. E. C. Roberts. This bird laid 117 first-grade eggs in the 122 days.

A significant feature in connexion with the Burnley Egg-Laying Competition is that Legbars are competing for the first time. The Legbar is one of the more recently developed breeds which possesses the quality of sex-linkage within itself, no further crossing being necessary, and therefore the sexes of the chickens produced from them may be distinguished by their colour at the time of hatching.

INDIVIDUAL BIRDS—SINGLE TEST

In the class for White Leghorns fed on wet mash, Lenham Poultry Farm (Mr. F. Smith) won first prize with a bird that laid 110 eggs, all first-grade. Equal second prizes were awarded to Messrs. K. Mathieson, and J. E. Smythe, each of their birds laying 100 eggs.

In the White Leghorn class fed on dry mash, first prize went to a bird entered by Miss A. E. C. Roberts with a total of 117 first-grade eggs. Miss Roberts also gained second prize with a bird that laid 104 eggs, and Mr. W. Dryden's bird was third with 101 eggs.

First prize in the class for All Light Breeds, other than White Leghorns, was awarded to Mr. T. Harding, whose Ancona laid 93 eggs, all first-grade. Mr. Harding also gained second prize with an Ancona that laid 79 eggs, and Mr. H. L. Chalmers secured third prize with a Legbar that laid 65 eggs.

In the class for Australorps, Mr. F. Robson won first prize with a bird that laid 108 first-grade eggs. Mr. A. S. Cook gained second prize with a bird that laid 107 eggs, and Mr. W. Yates's entry was third with 106 eggs.

Mr. A. J. Collins obtained first prize in the class for Rhode Island Reds, with a bird that laid 95 eggs, all first grade. Mr. G. H. Hetherton's bird gained second prize with a total of 81 eggs. While

third prize was obtained by Messrs. Milledge Bros.' entry which laid 77 eggs.

First prize in the class for all Heavy Breeds, other than Australorps and Rhode Island Reds, was awarded to Mr. J. Lang, whose Langshan laid 98 eggs, all first-grade. Mr. J. Lang also gained second prize with a Langshan that laid 89 eggs, and Mr. D. Granter secured third prize with a White Wyandotte that laid 77 eggs.

Winter Test Prize List, 1946-47

INDIVIDUAL BIRDS—SINGLE TEST

Pen No.	Name and Address.	Total Eggs.	Under-weight.	First Grade Eggs.
	Class 1.—White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
150	Lenham Poultry Farm (F. Smith), Terang	110	..	110
	Equal Second Prize—Government Certificate.			
159	K. Mathieson, 11 George-street, Reservoir, N.19	100	..	100
	Equal Second Prize—Government Certificate.			
183	J. E. Smythe, Drouin-road, Longwarry	100	..	100
	Class 2.—White Leghorns—Dry Mash.			
	First Prize—Champion Certificate.			
227	Miss A. E. C. Roberts, "Range View," Launching Place	118	1	117
	Second Prize—Government Certificate.			
228	Miss A. E. C. Roberts, "Range View," Launching Place	106	2	104
	Third Prize—Government Certificate.			
200	W. Dryden, 81 Monash-street, Sunshine, W.20	101	..	101
	Class 3.—All Light Breeds, other than White Leghorns—Wet Mash.			
	First Prize—Champion Certificate.			
112	T. Harding, Spring-street, Thomastown (Ancona)	93	..	93
	Second Prize—Government Certificate.			
111	T. Harding, Spring-street, Thomastown (Ancona)	79	..	79
	Third Prize—Government Certificate.			
109	H. L. Chalmers, 9 Le Fevre-street, Spotswood, W.14 (Legbar)	76	11	65

Pen No.	Name and Address.	Total Eggs.	Under-weight	First Grade Eggs
	Class 4.—Australorps—Wet Mash.			
	First Prize—Champion Certificate.			
40	F. Robson, 16 Nelson-street, North Wonthaggi	110	2	108
	Second Prize—Government Certificate.			
9	A. S. Cook, 42 Loch-street, East Geelong	107	..	107
	Third Prize—Government Certificate.			
55	W. Yates, 64 Bank-street East, Ascot Vale, W.2	110	4	106
	Class 5.—Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
75	A. J. Collins, 15 Noble-avenue, Essendon, W.6	95	..	95
	Second Prize—Government Certificate.			
83	G. H. Hetherton, 8 Princess-street, North Coburg	98	17	81
	Third Prize—Government Certificate.			
94	Milledge Bros., 24 McKinley-street, Echuca East	77	..	77
	Class 5.—All Heavy Breeds, other than Australorps and Rhode Island Reds—Wet Mash.			
	First Prize—Champion Certificate.			
63	J. Lang, 46 Dundas-street, Thornbury, N.17 (Langshan)	98	..	98
	Second Prize—Government Certificate.			
64	J. Lang, 46 Dundas-street, Thornbury, N.17 (Langshan)	89	..	89
	Third Prize—Government Certificate.			
59	D. Granter, 163 Martin-street, Gardenvale, S.4 (White Wyandotte)	85	8	77

ORCHARD NOTES

Codling Moth Control — Re-Working Apple and Pear Trees

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor

CODLING MOTH CONTROL

OCTOBER is the month during which the spring brood of codling moths commences activity, and from now until the fruit is safely packed in cases, apple and pear growers have to concentrate on the control of this pest.

In every apple and pear district in Victoria, sets of lures containing a liquid attractive to the moths, such as diluted wine or apple juice, will be maintained by district Orchard Supervisors. These lures will be examined twice a week and the number of moths caught will serve as a guide for the application of sprays at the times when the insects are most active during the season. The information so obtained will be made available to growers as quickly as possible by means of circulars, wireless broadcasts and charts placed in prominent situations.

Some growers have made a practice of installing their own sets of lures, and this can be recommended to others who may be interested in moth activity on their own property. Ten jars, placed one in every third tree, and refilled weekly with a 10 per cent. solution of vinegar, apple juice, cider, waste wine or molasses, provide sufficient attraction. The lures should be checked at least twice a week, and it is wise to make an extra check following a warm evening, when moths are more active than usual. It can be assumed that eggs are laid in considerable numbers when the lure catch is high and, to be of any use, it is necessary to complete the spray within five to seven days of this period, otherwise the eggs will have hatched out.

There should be no need to emphasize the importance of early control of the moth. If considerable damage occurs late in the season this is a direct result of failure to check the moth in the spring.

The first spray on apples and pears should be applied when the petals have fallen. This spray is important because the calyx, one of the vulnerable points of attack, can be covered with lead arsenate before it closes. A thorough calyx spray is particularly necessary for pears because most of the early infection occurs at this point. Pear growers are advised to use long rods in preference to guns for this spray, because the pears are still standing upright and it is necessary to direct the spray downward into the calyx cup.

Sprays to use for Codling Moth

The first spray should consist of arsenate of lead, at the rate of 3 lb. powder or 6 lb. paste in 100 gallons of water. No advantage is gained by further increasing the strength of lead arsenate. For later sprays, the effectiveness of the spraying may be considerably increased by using a combination of summer white oil emulsion at the rate of 5 pints in 100 gallons with the arsenate of lead spray. Apple growers using lime-sulphur for black spot control must not use the combination oil—lead arsenate spray because of the risk of damage if oil is applied within three weeks of lime-sulphur.

Many growers have indicated their intention of using D.D.T. for codling moth control following the excellent results obtained by the use of this material on an experimental scale, but it should be used with considerable caution. As already indicated in this Journal, the Department cannot recommend the use of D.D.T. because investigations are not yet sufficiently advanced. If used while bees are still in the orchard, considerable numbers of these insects may be killed. Constant use of the spray may also result in destruction of the

woolly aphis parasite, following which, infection by aphis may become serious. The build-up of Bryobia and Red Spider under D.D.T. sprays is another reason for added caution.

REWORKING APPLE AND PEAR TREES

With the possible resumption of large-scale fruit export, apple and pear growers should give some thought to the changing over of unsuitable varieties to others more acceptable to this trade. The most suitable apple varieties are Jonathan, Granny Smith, Yates, and Delicious, while pear varieties include Packham's Triumph, Winter Cole, Winter Nelis, and Josephine.

By using one of the frameworking methods, i.e., needle graft, stub graft, bark graft, trees can quickly be returned into production compared with the crown grafting method. More labour is required for frameworking, but quicker returns are obtained by the use of this method. Grafting is best done at this time of the year and may be continued until November during which period the bark of the tree to be grafted lifts easily.

Applying the pole-grafting method on a pear tree.

A necessity in successful grafting is ot properly seal the graft with some suitable mixture, such as tallow, beeswax and resin, or starch and bitumen emulsion. Indeed, as a precaution against polystictus infection, which seems to be increasing on many properties, all cut surfaces should be covered with bituminous emulsion when trees are cut back for grafting.

Vitamin Deficiency in Poultry

A confusingly large number of vitamins has been discovered in recent years, but the poultry feeder is primarily concerned with vitamin A. Cereal products, meat-meal, and dried skim-milk are all poor sources of this vitamin, so that recourse has to be made to the provision of green crops, lucerne, vegetables, &c., to make up the deficiency in the diet of poultry. All green plants will provide vitamin A, but the potency varies, and with the doubtful exception of lucerne, is lost on drying. Fresh tomatoes and carrots are also good sources of vitamin A. Green feed should be given daily.

When fresh green material is not available, a fish liver oil supplement should be used, mixed with the mash daily, one part oil to 100 parts mash. It must be remembered that vitamin A potency is lost after being mixed a few days, and that the tin of oil must not be left open.

Laying fowls will soon show decreased production on a ration deficient in vitamin A. Their eggs show lowered vitamin A content, leading to a poorer storage of this necessary vitamin in the chickens hatched from those eggs. Young stock rapidly cease growing, lose condition, and develop cheesy deposits in the eye and in the sinuses of the head. These symptoms resemble fowl pox and laryngo-tracheitis. Should the birds develop nodular thickening in the gullet however, this is certain evidence of vitamin A deficiency.

Chickens may develop rickets from vitamin D deficiency. The symptoms are poor growth and bone softening and deformation. Brooders should be designed to readily admit sunlight which provides a remedy for this condition.

[by D. McQueen, B.V.Sc., Veterinary Officer.]

THE FLOWER GARDEN

By T. H. KNEEN, B.Agr.Sc., Acting Principal
School of Horticulture,
Burnley Gardens

VIABILITY OF SEEDS

EVERY gardener appreciates the necessity of using seed of good viability when making sowings, for example, of annuals for the summer display. Reliable seed firms stamp a date on the packet beyond which the seed should not be sold, so that there is little risk of purchasing old seed. Some seeds, of course, normally give a poor percentage germination. Nasturtium is an example, and for this reason it is wise to sow two or three seeds for each plant desired.

This problem of viability usually presents itself when the gardener is looking over surplus seed from previous seasons and comes across varieties which he would again like to sow and which, perhaps, are not readily available. As a general rule, most seeds of annuals may be considered as viable for two years while many are viable for three and four years. Only a few annual seeds are viable for longer periods than this. Not all authorities agree on the precise length of life of seeds, for indeed it is a variable factor influenced by numerous environmental conditions. Seeds of annuals which are viable for periods of three to five years include *Petunia, Nasturtium, Celosia, Gypsophila, Amaranthus, Nicotiana, Linum, and Saponaria. Balsam* seed is viable for from five to eight years.

There are other annual seeds which can be relied upon only for one season, such as *Phlox* and *Asters*, while others such as *Salvia* are so variable that they can be relied on for only one season.

If it is particularly desired to use seed from a previous season and there is some doubt as to its viability, a trial sowing can be made. Given favorable conditions, such as prevail at this time of the year, the great majority of seeds will germinate in ten days or less. Seeds which can be expected to take up to a fortnight to germinate are *Nigella, Scabious, Guillardia, Primula, Linum*, and *Sweet Pea*. Even slower than these are *Nasturtium, Nemesia*, and *Larkspur* which may take almost three weeks to germinate. Not all of these, of course, are sown at this time of the year. One that is variable is *Lobelia* which may take anything from five to twenty days to germinate.

In general, the wisest policy is to secure just sufficient fresh seed each year, as the majority of annual seeds are short-lived compared with the seeds, for example, of trees and shrubs.

THE WINDOW BOX

A window box exposed to full sunlight is very suitable for the growth of a number of easily grown annuals such as *Petunia, Nasturtium*, dwarf varieties of

[*continued on page 485.*

THE VEGETABLE GARDEN

Suggested Varieties for October Sowing

Vegetable.	Variety.	Occupy the Ground for Approximately—
Lettuce	Mignonette	3 months
	Iceberg	,,
	Imperial 44	,,
Beans—		
Dwarf French	Brown Beauty	,,
	Hawkesbury Wonder	,,
Runner	Scarlet Runner	6 months (grow on fence, &c.)
Tomato	Tatinter	7 months
	Orange Prolific	,,
Cabbage	Succession	5 months
Broccoli (Kale)	Green Curled	8 months
Pumpkin	Queensland Blue	5 months
Marrow	Green Bush	,,
Cucumber	Long Green Prickly	,,
Potato	Carman No. 3	,,
	Snowflake	,,
Sweet Corn	Golden Bantam	4 months

October is a month suitable for sowing seeds of a number of frost-sensitive crops, mainly dwarf French beans, pumpkins, marrows, cucumbers, and sweet corn. Further sowings of carrots, parsnips, and red beet suggested for last month can be deferred until December and early in the new year for winter use. Sweet corn is not productive enough for the average small garden but, nevertheless, is a great favorite and may be included, if room is available. Scarlet Runner beans are worth growing on a fence that receives full sun, or on a temporary dividing fence within the garden itself to provide a windbreak.

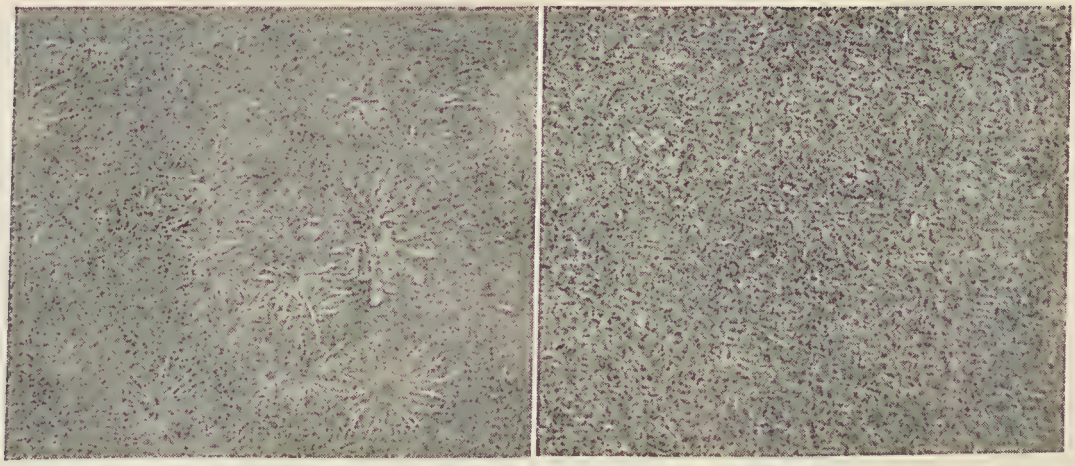
To provide a continuous supply, French beans should be sown at monthly intervals right through until February. Lettuce should be sown also at monthly intervals, but it will be necessary to be sure of growing a variety suitable for the particular time of the year, otherwise trouble may be experienced with the plants going to seed. Suitable varieties for this month are given in the table above.

LIQUID MANURE

Leaf crops, such as lettuce and cabbage frequently need a stimulant to maintain rapid growth—with these crops a check in growth may result in many plants failing to "heart" properly and running to seed. Silver beet, beetroot, tomatoes are other crops which benefit from manuring during growth. One of the methods used to stimulate and maintain growth is to use a weak liquid manure made up either from artificial nitrogenous fertilizers such as sulphate of ammonia or nitrate of soda, or from animal manures such as cow, poultry, &c.

The artificial manures mentioned should be dissolved at the rate of 1 oz. to 4 gallons of water. Liquid manure may be made from animal manure by tying it up in a bag and immersing it in water for at least forty-eight hours. Two or three pounds to each gallon of water is sufficient.

Liquid manure should be applied after a thorough watering and not to a dry soil. The foliage should be lightly hosed down if any fertilizer has come in contact with it.



Weed control by manurial treatment. Left.—Weedy turf. Organic manures (blood and bone) only. Right.—Clean turf. Manurial mixture including superphosphate, sulphate of ammonia and sulphate of iron. Both plots were sown with the same seeds mixture four years previously and have not been hand weeded.

The organic manures are less rapidly available than is sulphate of ammonia, and are therefore slower acting, but they produce a more lasting response. The mixing of some organic manure with sulphate of ammonia will therefore lengthen the period over which a response is obtained from a single application.

Lime for Lawns

In a general way it may be said that the application of lime to lawns, or to ground to be planted with lawn, is not recommended. It is a well-known fact that the true turf grasses are able to grow well on acid soils, and in fact in their native habitats the soil is invariably of an acid nature. One important factor in the control of weeds in lawns is the ability of the turf grasses to withstand a greater degree of soil acidity than can many of the common weeds, so that a somewhat acid soil condition is definitely desirable, and care should be taken not to destroy this condition by the indiscriminate use of lime. Extreme conditions may of course exist, or be induced by heavy applications of sulphate of ammonia and sulphate of iron, and need correction by liming but, excepting these extremes, the application of lime to lawns is likely to do more harm than good. If, after a number of years, it is noticed that the lawn is ceasing to give a normal response to applications of sulphate of ammonia, it may be given a dressing of lime equal in amount to the total amount of sulphate of ammonia which has been applied over the period.

Spreading of Manures

One of the greatest difficulties experienced by amateurs is to achieve an even spread of the materials applied to lawns. Sulphate of ammonia and sulphate of iron in particular produce a very visible response—visible both as increased growth and changed colour, and a patchy result mars the appearance of the lawn. The exact amount of each ingredient to be applied should be calculated according to the yardage to be covered, weighed out and, if lumpy, worked through a sieve. The separate ingredients may then be thoroughly mixed together and mixed into a larger quantity of sand or dry sandy soil.

This mixture should then be divided into four equal parts and the whole lawn gone over four times, each time walking in a direction at right angles to the last, and broadcasting the material by hand, throwing it with a definite scattering motion, and on no account attempting to sprinkle it on. Sulphate of ammonia causes slight scorching of the leaves, and sulphate of iron, especially if applied while the grass is damp, results in some blackening. Both results are, however, temporary and need not cause alarm. Both chemicals are capable of doing severe damage if used rashly, and for this

reason the elimination of all lumps from the mixture before broadcasting is most important. Neither chemical should be allowed to come in contact with the leaves of other garden plants.

Renovation and Topdressing of Existing Lawns

Most lawns will show a rapid improvement if given the manurial treatment as outlined above. Where, however, weeds and particularly clovers are abundant, a mixture of 3 parts of sulphate of ammonia and 1 part sulphate of iron should be given in three applications of 6 lb. per 100 square yards, at intervals of four to five weeks, before starting on the manurial schedule proper. Of recent years there has been a development of weedicides having a selective action. These materials tend to eliminate the broader-leaved weeds and clovers while the narrower leaved grasses suffer little or no damage. These selective weedicides show definite promise of providing an effective means of cleaning up very weedy turf, but are still to some extent in the experimental stages. Such materials are unlikely to have any effect on unwanted grasses, such as water couch and paspalum, which are most effectively, and probably most economically, dealt with by digging, thoroughly cleaning the ground and re-seeding. In connexion with the use of weedicides, it should be remembered that the mere killing of the weeds in turf will not give any permanent freedom from weeds, unless grass growth is encouraged and conditions made unfavourable for their reappearance by correct manurial treatment.

The regular topdressing of playing greens with soil is necessary to true up the surface and to enable repairs to be made and fresh seed to be sown on the worn areas. On garden lawns, however, this frequent topdressing is not necessary. Creeping bent lawns do respond to regular topdressing, but a correctly manured brown top lawn will remain in good condition with only a very occasional application of soil.

A common mistake in the topdressing of lawns is the spreading of too thick a layer of soil. The grass should never be completely buried, but the soil applied thinly and worked in with the back of a rake so that the leaves can still be seen showing through. The benefit of topdressing is increased by giving the lawn a heavy raking followed by a close mowing before spreading the soil. Such treatment will slightly loosen the surface and will remove any old dead grass and lift runners of creeping grasses and weeds to be cut off by the mower. Such treatment, far from damaging the true turf forming grasses, will stimulate the production of the fresh shoots, on which a lawn depends for its maintenance, in a dense leafy condition.

The rolling of lawns, as distinct from bowling greens and tennis courts, is regarded as being neither necessary nor desirable. Minor surface irregularities can be adjusted by topdressing, and larger mounds and depressions cannot be disposed of by rolling. Where such occur the only remedy is to remove the turf from the affected areas, level the exposed soil, replace the sods, and finally true up the surface with a light topdressing of soil.

Watering and Mowing of Lawns

To reap the full benefit of all the other work of establishing a lawn, careful attention to the details of watering and mowing is necessary.

It is quite possible for a well tended sward of the coarser grasses and weeds to look more attractive than does a neglected lawn of the better turf forming grasses.

Under Victorian climatic conditions the necessity for regular summer watering is generally accepted. All lawn grasses, including those described as drought resistant, require adequate watering during dry periods to keep them green and vigorous. The difference between the drought resistant and the non drought resistant grasses lies more in the ability of the former to survive severe dry spells without death, but in a more or less dormant condition, rather than in any ability to maintain vigorous growth without water.

In applying water to lawns it is desirable to wet the ground as deeply as possible, and for this purpose the practice of heavy watering at intervals of a few days is better, and more economical, than is a daily light watering. The length of time between waterings will of course depend on the weather conditions prevailing and on the depth of the root system of the grass. Couch grass, with its deep roots,

is able to carry on for a much longer period on a single good watering than is brown top, with its surface growing habit. Dryland brown top, with its well developed underground runners, holds on better and is less likely to suffer permanent damage if allowed to brown off, than ordinary brown top, but it also requires abundant water to keep it green and leafy during hot, dry weather. The deeper penetration of water can often be encouraged by forking during the summer, particularly on slopes and areas which tend to become hard and impervious.

The degree of closeness and frequency of mowing to which a lawn is subjected will have an important bearing not only on its appearance, but also on its botanical composition. The true turf forming grasses have either a crown which is set low in the ground, or well developed surface or underground runners, and are thus able to withstand constant keen mowing without serious damage. The coarser, higher crowned grasses like perennial rye-grass, on the other hand, are damaged and gradually die out under very close and regular mowing. Garden lawns are not usually mown as closely as are golf and bowling greens. It has been found, however, that a brown top, or brown top and fescue lawn, forms a denser and cleaner turf if fairly closely and frequently mown, than if allowed to grow longer and mown less frequently.

The mowing practice which is most damaging to a fine lawn is infrequent but severe mowing. If the grass is regularly allowed to grow long leaves and then is cut close to the ground in one stroke, an open and weak turf will result. The best method is to mow to a constant height as frequently as possible, as such treatment stimulates the production of new shoots and maintains, with proper manurial treatment, a dense and vigorous sward. It is desirable to leave the grass a little longer during the hottest part of the year, but any change in the closeness of mowing should be effected gradually. If by any chance the grass is allowed to become abnormally long, it should not be cut down to the normal height in one cut, but reduced a little at each cutting until the usual height of cut is reached.

It is usual to catch the clippings from a lawn in a container attached to the mower, and not allow them to fall back on the lawn. If the clippings are allowed to fall, they form a mulch which tends to keep the ground moister, and as they decay, provide a certain amount of plant food. During winter, and in damp weather in spring, the clippings do not quickly disappear, and tend to collect in damp masses which may cause local damage to the grass as they decay. During the summer the clippings rapidly wither and are absorbed into the turf, and their mulching effect at this time of the year is of value. The clippings may, therefore, be allowed to fall in the summer without disfigurement and with benefit to the lawn, but at other periods, and particularly in wet weather, it is best to box and remove them.

THE FLOWER GARDEN *(continued from page 481)*

French Marigolds, such as *Firefly* and *Harmony*, dwarf varieties of *Phlox drummondii*, such as *Dwarf Cecily* and, in fact, all sun-loving dwarf and trailing annuals.

A suitable soil mixture for the window box is made up by enriching any good light loam with well-decayed cow manure and leaf mould. The soil for *Nasturtiums* should not be made too rich as this encourages leafy growth at the expense of blossom. Owing to the restricted space available for root growth, it will be found beneficial to apply liquid manure occasionally, especially when it is seen that the box is becoming a mass of roots.

Generally speaking, staked and pruned tomatoes are the most satisfactory to grow in a small garden.

In Melbourne and southern Victoria, October and November is quite early enough to plant out tomatoes. Even if earlier planted tomato plants survive, they will only produce a few odd early fruits and their main crop will be no earlier than those planted at the proper time.

If the plants are purchased, accept only those that show that they have been well hardened off. This is indicated by dark green leaves and stout bluish stems. Lanky, light green, flaccid plants indicate that they have not been hardened off properly. Don't be misled into planting too early by seeing early plants offered for sale, sometimes as early as July.

Raising of tomato plants from seed is not difficult in seed beds or boxes. It will be early enough to sow them eight weeks before they are required for planting out. Seed beds should be provided with some shelter against frost or excessive wind. There is no need to provide a hot-bed or glass frame in the small home garden, but sheets of glass to cover the seed box will hasten germination. After they reach the two-leaved stage, they should be pricked out into open beds or boxes, or separately in flower pots or jam tins, with only sufficient shelter to prevent damage from wind or excessive rain. Cover the seedlings as little as possible, especially when nearing the planting-out stage.

Much loss from insects and diseases may be saved by regular dustings with one of the special tomato dusts right from the time of planting to the setting of the fruit. Many of the diseases are conveyed from plant to plant by insects, so that these dusts are made up to contain insecticides and fungicides in combination. The seed should always be dusted before sowing.

Frequent overhead watering should be avoided. This also helps to convey disease. Disease is easier to control on plants that have been pruned to a few stems.

Apart from the base manure applied before planting, the plants should not be forced by side-dressings until they come into flower, and water should be used sparingly until they reach this stage. Afterwards, when fruiting, liberal quantities of both should be applied.

Method of pruning tomatoes.

Pruning consists of pinching out the laterals and retaining 1, 2, or 3 leaders. "A" denotes where the lateral growths should be pinched out and "B" the flower "sets" or fruit. When the plant reaches the top of the stake, pruning can be discontinued.—If early varieties are grown and early fruit is required, the top of the plant should be pinched back about the height of the top of the stake.

A fuller description of various methods of growing tomatoes and the many varieties which can be successfully grown in different parts of Victoria can be found in the Department's Bulletin *Tomato Culture*, which may be obtained on application to the Director, Department of Agriculture, Melbourne, for the sum of 1s., which includes postage.

The varieties recommended for home gardens are :—

Early crop—

Tatura Dwarf Globe Burwood Wonder.. Earliana	Unpruned bush types

Mid-season crop—

Tatinter	Unpruned bush types
Burwood Wonder ..	
Salad's Special ..	Pruned, tall-growing type
..	

Late crop—

Potentate ..	Pruned, tall-growing types
Salad's Special ..	
Walker's Recruit ..	
Orange Prolific ..	
Grosse Lisse ..	

Soil Preparation for Tomatoes

For seed beds or boxes, use a light sandy soil which has been sterilized by pouring boiling water over it. Work in a small dusting of superphosphate. Soil for pricked-out seedlings should be light with some rotted manure or compost added.

The beds should be dug deeply some weeks before transplanting, adding some organic manure if none has been worked in for the previous crop. Apply 2 oz. of blood and bone to the square yard on the surface and rake in.

Sowing and Planting Tomatoes

Sow the seed on the surface, thinly in drills. Cover with a sprinkling of rotted manure or compost. Prick out in the two-leaved stage. In transplanting, lift the plants with as much soil adhering to the roots as possible, and plant so that the lowest leaf is just above the ground. Water them in with the nutrient solution, and after they become established, keep the soil moist until they start to flower, when more water can be given. Insert the stakes before planting.

Cultivation of Tomatoes

Keep weeds down, but do not hoe too close to the stems or too deeply, and draw the soil towards the plants as they grow. Start to prune as soon as the laterals appear by pinching them out. When the first flowers appear, apply superphosphate, sulphate of ammonia and sulphate of potash (4 : 1 : 1) in bands on each side of the plant at the rate of a teaspoonful per plant every third week during the fruiting season. All tomato plants should be dusted with a combined tomato dust from the time of planting until February, applying the dust every three weeks.

Harvesting Tomatoes

Pick when completely coloured, but not full ripe. Hold the tomato in the hand and press with the thumb or forefinger on the thickened portion of the stem which is seen about $\frac{1}{2}$ inch from the fruit. The fruit will then come away easily without damaging the rest of the fruit on the bunch or cluster. Avoid tugging the fruit off as this may break the branch.

Seed Treatment

Dust the seed with Cuprox, Agrosan or Ceresan.

THE VINE VEGETABLES

Vine vegetables or cucurbits comprise all those vegetables which fruit on trailing vines or runners, such as pumpkins, squashes, marrows, cucumbers, and melons. They have no special place in the garden rotation, but as they are gross feeders, are better not grown immediately before or after leaf crops. The method of growing is the same for all kinds and they should be planted in a position where their runners will not intertere with other crops. They must be planted in the full sun otherwise they are prone to mildew. They need abundant water applied round them rather than by overhead sprinkling except for occasional sprinklings after hot and dry winds.

In the home garden where space is limited, a few plants can be induced to bear prolifically with a little extra attention.

Hand-pollinating cucurbit flower. Remove petals from male flower, and brush the pollen on to the female flower. This is best done in the early morning when the petals are open.

Cucurbits produce separate male and female flowers, and to produce fruit abundantly, it is desirable to hand-pollinate the female flowers as illustrated. The plants can be kept within bounds by nipping back the main runners after they have grown to a length of about 2 ft. from the base. This causes lateral growth to form and it is upon these laterals that most of the female flowers are formed. By hand-pollinating, nearly every female flower will form fruit and plenty of medium-sized fruit will be produced. If allowed to grow and pollinate naturally, the tendency is for the vines to straggle and fewer, and perhaps oversize, fruit will be formed.

The vine vegetables are all frost sensitive, but the best results will be obtained from planting as early as possible after the frost season, particularly in southern areas, and especially so in the case of melons. Where available, the bush and long-keeping varieties are preferable for the home garden.

Pumpkins and marrows are useful in conditioning new ground. In this case, they can be allowed to run without much pruning back. Their heavy foliage suppresses weeds, and they are particularly useful in bringing couchgrass-infested plots back into cultivation.

Soil Preparation for Vine Vegetables

The whole plot should be dug deeply and a liberal quantity of organic manure should be dug in. After levelling the bed, dig holes about 10 inches deep and 12 to 18 inches in diameter at the correct planting distance, and put a half bucketful of rotted manure or compost at the bottom. Fill in the top soil so as to leave a small mound or hill about 6 or 8 inches above soil level, leaving a small hollow round its base. If organic manure is not available, place 4 oz. of blood and bone under each hill.

Sowing and Planting Vine Vegetables

Sow three seeds to each hill. The seeds may also be sown in seed boxes and transplanted. Better still, they can be sown in groups of three in a pot or jam tin. By these means, early plants may be raised under cover or later, advanced plants may be raised and held, to plant after a late spring or early summer crop of other vegetables.

Cultivation

Little hoeing is needed. Draw the soil up towards the young plant and keep it moist at all times. At the first signs of the leaves wilting, apply water. Give frequent applications of liquid manure during growth, as soon as the plants start to set fruit.

Harvesting Vine Vegetables

Vine vegetables, except melons, can be picked for use at any stage of growth, but the keeping sorts wanted for storage should be allowed to reach full maturity and are better left on the plants until the vines start to dry off. Harvesting the early fruits before full maturity will keep the vines in production. Cucumbers should be harvested well before full maturity and to keep them producing, they must be picked frequently. Melons are ripe when the stems of the fruit show slight shrivelling.

When harvesting, cut off the fruit with about an inch or so of stem attached. If this stem is pulled off, decay will soon occur even in keeping varieties.

Seed Treatment

The seeds of all vine vegetables should be dusted with Agrosan or Cuprox.

The foregoing is the second instalment of an article dealing with the growing of vegetables in the home garden. The first instalment appeared in the August issue and further instalments will appear in subsequent issues of the Journal.

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SHEEP MANAGEMENT STUDIES AT WALPEUP

Carrying Capacity and Hand-feeding under Drought Conditions

By H. J. SIMS, M. Agr. Sc., B. Com., *Manager, Mallee Research Station, and* C. G. WEBB, M. Agr. Sc., *formerly Agricultural Research Officer.*

IF stability in farming and grazing operations is to be achieved in districts with an erratic and unreliable rainfall, such as the Mallee, stockowners must make provision for the supplementary feeding of sheep and other stock. Such feeding may be necessary for short periods, particularly during the autumn; but in years of severe droughts, prolonged hand-feeding is necessary if even the nucleus of a flock is to be maintained. Many farmers contend that if a severe drought is expected, it is better to cut one's losses at the beginning, and dispose of all stock, even at sacrifice prices. Under such circumstances, restocking presents very serious problems, because desirable young sheep are practically unprocurable at reasonable prices.

Owing to war-time difficulties, fodder reserves at the end of 1943 were lower than many prudent farmers thought safe. At that time, large amounts of wheat, which were available for stock-feeding purposes were stored throughout the country. Therefore the use of wheat as a stock food became prominent in discussions among sheepmen at that time and during the severe drought conditions that followed in 1944–45. Many farmers were in general agreement that wheat was satisfactory as a supplementary stock food, but were doubtful regarding its use as the main portion of a drought ration. It was known that the unlimited use of wheat could cause the death of horses and other stock, and in addition there was little quantitative data available concerning the amounts of wheat that could be fed safely to sheep under paddock conditions.

With the object of gaining information on some of these subjects, a trial was designed and commenced at the Mallee Research Station, Walpeup, in November, 1943—at the end of a dry spring.

The drought of 1944 was not anticipated, and the severe conditions during that year made necessary much more hand-feeding than was originally planned. This was carried out from autumn until the lambs were disposed of or weaned in October, thus enabling the recording of valuable information during the eleven months of the investigations. Rainfall for the duration of the experiment, and the average monthly rainfall are as follows :—

	1943–44.	Average.
	Points.	Points.
November	82	90
December	72	92
January	20	70
February	18	85
March	39	74
April	44	78
May	156	119
June	16	131
July	97	117
August	16	133
September	48	136
October	89	139
Total for twelve months (November–October)	697	1,264

It will be seen that for the duration of the trial, the rainfall was very much below average.

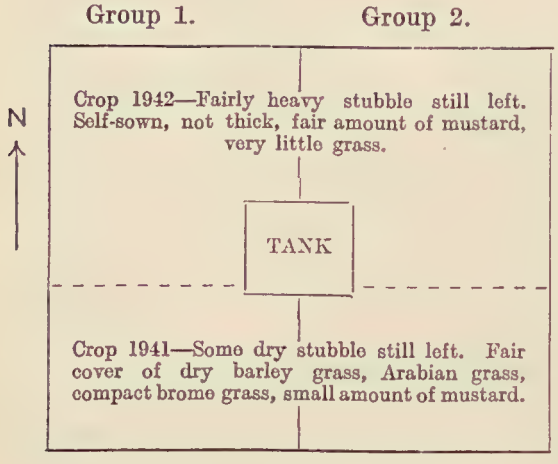
The first objective of the trial was to obtain information concerning the supplementary feeding of lambing ewes, particularly with wheat. With this object in

The feeding trough used for feeding the sheep in Group 1.

view, the stocking rate of one group was chosen to ensure that hand-feeding would be necessary (Group 1), while it was anticipated that, with average seasonal conditions little if any hand-feeding would be required in the other group.

A well-grassed area of 575 acres was divided into two equal sections containing comparable feed, which consisted of naturel grasses (barley grass, Arabian grass, compact brome grass), mustard and stubble from the 1941 and 1942 crops. Both sections wera watered from the same tank.

The layout of the area used, and the nature of the feed available at the commencement of the trial are shown in the accompanying plan.


Group 1.
Group 2.
N
Crop 1942—Fairly heavy stubble still left. Self-sown, not thick, fair amount of mustard, very little grass.
TANK
Crop 1941—Some dry stubble still left. Fair cover of dry barley grass, Arabian grass, compact brome grass, small amount of mustard.

Following the rains in May, there was a fairly good germination of mustard and grasses, but without following rains this did not make satisfactory growth, and hand-feeding was continued throughout the winter. For a short period at the end of May, Group 2 did not eat all the wheat offered to them, and each day the residue was weighed and the amount in the troughs was then made up to the 0·9 lb. per head. During this period of approximately three weeks, this group ate only about 0·6 lb. per day. Group 1 ate their ration all the time, but at this period they left the long straws from the chaff in the feeders.

As the winter progressed, the amount of dry stubble, particularly in the area grazed by Group 1, steadily decreased and in October, 1944, there was considerably less dry roughage on this area. Throughout the winter, in both sections—but making better growth in Group 2—was a small amount of green picking, but it was always kept extremely short.

Three different lines of station bred ewes were used, each line having equal representation in the two groups, and were as follows :—

(*a*) 146 five and six-year-old merino ewes, which after being carefully mouthed, were subdivided as 63 sound-mouthed and 83 poor-mouthed ewes.

(*b*) 37 four-year-old merino ewes, referred to in this article as "Urisino".

(*c*) 132 four-tooth Border-Leicester x merino ewes which were purchased just prior to the experiment.

These ewes were subdivided so that 210 ewes (Group 1) were grazed on one-half—the western portion—and the remaining 105 ewes (Group 2) were grazed on the eastern portion of the block.

Table 1 shows the numbers of each line of ewes in each group at the commencement of the experiment. Thus the rates of stocking were approximately three sheep to 4 acres and three sheep to 8 acres respectively. Dorset Horn rams were mated with each group of ewes on 15th November, 1943. Regular weighings were conducted at monthly intervals until lambing commenced.

Strong-woolled merino ewes used in the trial.

Commencement of Hand-feeding

Until 2nd March, 1944, no supplementary feed was given to either group, but at that date, because of the steady loss of weight of the ewes of Group 1, hand-feeding with wheat was commenced at the initial rate of 2 oz. per head per day. The wheat was fed in bag troughs, and after being driven to it in the early stages, the sheep soon came to the troughs of their own accord, and consumed the wheat as soon as it was put into the troughs. The ration was doubled on 22nd March, increased to 6 oz. per head on 24th March, and to ½ lb. on 16th April, and to 0·9 lb. after 24th April. In addition 8 to 12 oz. of chaff per head per day was fed from 28th March. The feeding of wheat to Group 2 was commenced on 19th March, at the rate of 2 oz. per head per day, and increased in gradual stages to 28th April, when 0·9 lb. per head per day was fed. This group did not receive chaff at any stage of the experiment. The supplementary feeding of all ewes was continued until 20th September, when as described below, the dry ewes were drafted out, also ewes with lambs of a certain weight, the remainder of ewes being hand-fed until the lambs were despatched for slaughter on 13th October.

TABLE 1.—DIVISION OF EWES, NOVEMBER, 1943.

Type of Ewe.	Group 1 (West Section).	Group 2 (East Section).	Total.
Old merinos—sound mouths..	42	21	63
Old merinos—poor mouths ..	55	28	83
Merino, Urisino	25	12	37
Border Leicester x Merino ..	88	44	132
Total	210	105	315

Although there was sufficient space at the feeders for every sheep, it was apparent that some consumed more than others; this was particularly noticeable with some of the crossbred ewes, which, contrary to expectations, did not come to the feeder readily, even when obviously requiring supplementary feed. A mixture of equal parts of salt and lime was provided for the sheep for the duration of the experiment.

On 20th September, in an attempt to finish the lambs for the market, those lambs weighing between 52 and 63 lb. live weight and their mothers (from both groups), were transferred to green oats. The lambs not included

Experimental weighing of sheep at the Mallee Research Station.

above, i.e., those under 52 lb. or above 63 lb. and their mothers, were still retained on the supplementary feed until 13th October, when all lambs that were fit were despatched to the freezing works. In addition, the dry ewes were transferred to another grass paddock. This variation in the experiment did not take place until after shearing, and therefore does not affect any of the ewe comparisons made.

Up to this time, a total of 167 bags of wheat and 10 tons of chaff were fed to the three sheep to 4 acres group; while the three sheep to 8 acres group had received 82 bags of wheat.

The lambs which were fit for slaughter were despatched for "killing over the hooks" on 13th October. The consignment comprised 36 lambs from Group 1 and 63 from Group 2. Full information concerning weights, grades, and valuation of these lambs was kept. At shearing time, fleece weights of each ewe were recorded, and the valuation of the wool of each line was obtained.

RESULTS

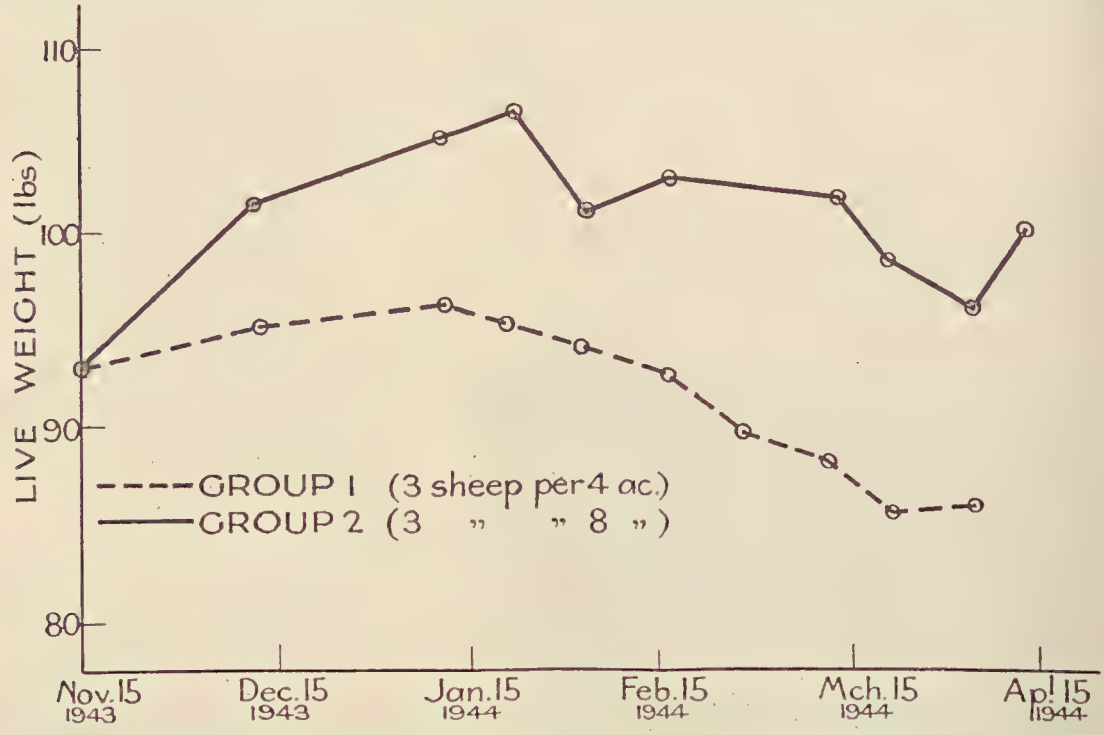
(a) Weights of Ewes

The progressive changes in the weights of the ewes until commencement of lambing are shown in Graph 1. The average weights of the ewes diverged soon after the commencement of the trial, those at the lower stocking rate gaining in weight early in the period, while those at the heavier rate of stocking just maintained their weight for the first two months. The latter group began to lose condition after mid-January, but the former, although then about 8 lb. heavier, maintained their weight at this higher level for several weeks.

In Group 1 the ewes continued to lose weight after the commencement of hand-feeding, and presumably because of this loss of weight, serious mortality due to pregnancy toxaemia was experienced. The loss of weight of Group 2 was not as great as that of Group 1, as the sheep responded to hand-feeding more quickly and thereby escaped mortality from pregnancy toxaemia.

When lambing commenced, weighings had or be temporarily discontinued, but were re-commenced at the end of June. From then on, weights showed a slight increase until the termination of weighings. The sheep in Group 1 were much stronger in September than in April.

Table 2 shows comparisons of ewe weights at four stages of the experiment—mating,



Graph 1. Live-weight fluctuations in ewes until commencement of lambing

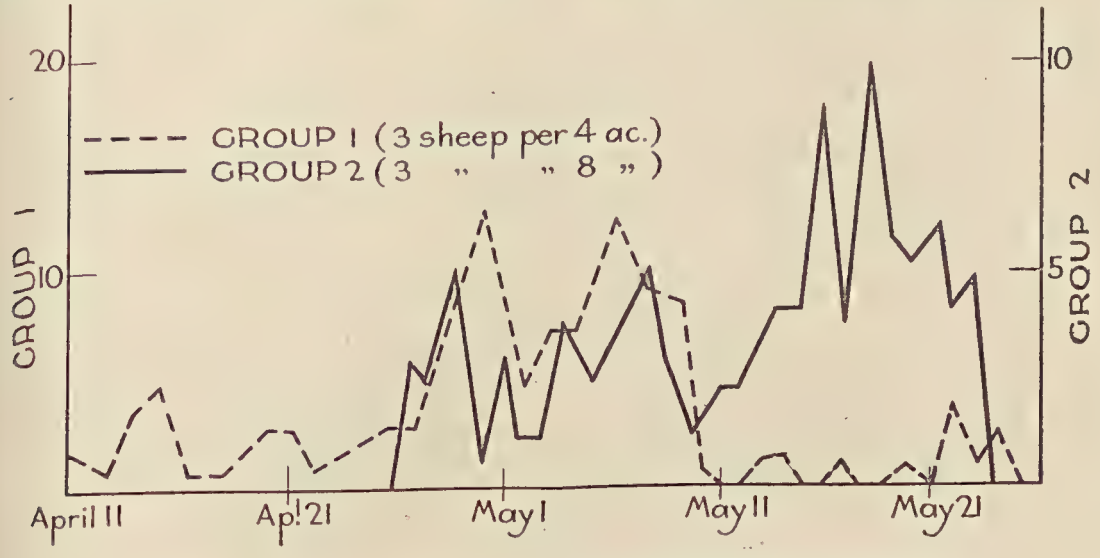
TABLE 2.—WEIGHTS OF EWES AT SELECTED STAGES DURING THE YEAR.

	15th November.		6th April.		28th June.		20th September.	
	Ewes Lambing later.	Ewes Remaining Dry.	Ewes Lambing later.	Ewes Remaining Dry.	Wet.	Dry.	Wet.	Dry.
Group 1.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Merino—sound mouth	94·7	91·8	86·8	83·6	81·6	84·3	84·4	86·0
Merino—poor mouth	92·8	91·7	86·2	84·7	80·9	85·3	83·6	86·7
Merino—Urisino	108·4	101·0	106·5	96·2	94·8	92·9	100·2	96·7
Border Leicester x Merino	92·2	92·2	83·0	82·7	80·9	84·7	86·9	92·1
Total	95·8	92·8	89·0	84·5	83·8	84·5	87·7	90·3
Group 2.								
Merino—sound mouth	96·3	94·0	96·2	95·3	85·7	93·3	89·0	97·3
Merino—poor mouth	92·3	85·7	91·8	85·7	83·4	86·0	87·4	89·0
Merino—Urisino	101·8	110·0	105·6	110·0	93·2	124·0	100·5	131·0
Border Leicester x Merino	97·9	86·9	99·5	90·4	81·7	83·7	93·5	96·6
Total	95·5	91·2	97·4	90·9	84·4	88·6	91·6	97·9

prior to and subsequent to lambing, and prior to weaning. The average weight of all ewes in each group at the commencement of the trial was 93·4 lb.

(b) Incidence of Lambing

Graph 2 illustrates the incidence of lambing in each flock. Although there is considerable daily variation in the number of lambs dropped, it is apparent that Group 1 had its greatest incidence of lambing about seventeen days or one heat period after the due date, while there were two peaks of concentration of lambing in Group 2, the first one being approximately the same time as Group 1, while the other peak was seventeen days later. Apparently nutritional conditions have some effect on the time of conception, as a similar phenomena of a double "peak" of lambing intensity and of



Graph 2. Incidence of lambing, showing lambs born per day in each group.

A home-made self-feeder used at Walpeup for feeding chaff and grain to sheep

time of conception under better feed conditions has been observed in Western Australia.(1).

(c) Lambing Percentage

Although the lambing was earlier in Group 1 than in Group 2, a much better drop and marking of lambs was obtained in the latter group. This was due partly to a better percentage of ewes conceiving, and partly to the fact that in the former group there were a number of deaths due to pregnancy toxaemia and the low condition of the ewes. There were two sets of twins dropped in Group 1 as compared with four sets in Group 2—which contained only half the number of ewes. The percentage of lambs born are tabulated in Table 3 :—

TABLE 3.—LAMBING PERCENTAGES.

Type of Ewe.	Group 1 (Three Sheep to 4 Acres).	Group 2 (Three Sheep to 8 Acres).
	%	%
Merino sound mouth ..	72·7	85·7
Merino poor mouth ..	69·0	76·2
Merino Urisino	68·0	75·0
Border Leicester x Merino	37·5	77·3
Total ..	56·7	79·0
Number of lambs ..	119	83

(d) Birth Weight of Lambs

In order to ascertain whether ewes maintained under better conditions produced lambs of higher birth weight, all lambs were weighed within a few hours of birth. The average weights of the single lambs are summarized in Table 4.

TABLE 4.—BIRTH WEIGHTS OF LAMBS (Singles only).

—	Group 1 (Three Sheep to 4 Acres).	Group 2 (Three Sheep to 8 Acres).
	lb.	lb.
Lambs from merinos—		
Sound mouth	8·5	9·3
Poor mouth	8·8	9·0
Urisino	10·7	9·5
Border Leicester x Merino	7·5	8·1
Total	8·6	8·7
Total (male lambs)	8·9	8·7
Total (female lambs)..	8·4	8·8

Although there is some variation in the weights of the sections within the groups, the average weight of each group itself is almost identical. This indicates that the differences of prenatal nutrition in this trial were not sufficient to affect the growth of the foetus.

(e) Returns from the Wool of the Ewes

The average fleece weights of the two groups are set out in Table 5 :—

TABLE 5.—AVERAGE FLEECE WEIGHTS.

—	Group 1 (Three Sheep to 4 Acres).			Group 2 (Three Sheep to 8 Acres).		
	Wet.	Dry.	All Ewes.	Wet.	Dry.	All Ewes
	lb.	lb.	lb.	lb.	lb.	lb.
Merino, old ewes	7·4	8·2	7·7	7·9	9·1	8·0
Merino, Urisino ..	7·8	9·4	8·0	8·2	9·7	8·3
Border Leicester x Merino ..	6·6	6·7	6·7	7·2	7·6	7·3
Total ..	7·3	7·5	7·4	7·6	8·2	7·7

Thus heavier fleeces were obtained in the lighter stocking group. The comparatively small difference between the two groups in the average of "all ewes" is because of the greater proportion of dry ewes in Group 1. In each group the dry ewes gave heavier fleeces than the ewes that had lambs.

In Group 1, clean scoured yields appraised by Goldsborough Mort and Co. from wet and dry crossbred ewes was the same, but

 [*continued on page 517.*

PIG RAISING COMPETITION

1946

Report by L. A. DOWNEY, H.D.A., Pig Expert

THE Bacon and Pork Pig-raising Competition of 1946, sponsored by the Royal Agricultural Society of Victoria and the Department of Agriculture was the third competition of its kind, others having been held in 1940 and 1941, but this year for the first time pigs and carcasses from the competition were exhibited at the Melbourne Royal Show.

In these competitions pigs are judged on their performances which were checked and measured by officers of the Department of Agriculture.

One of Mr. L. H. Castle's 1st prize entry of Large White bacon pigs.

Because it is recognized that the real value of a pig to its producer is not the selling price, but the difference between the selling price and the cost of production, the conditions of awards in these competitions are designed with the object of encouraging a proper economic balance between features affecting the cost of producing pigs and features affecting their sale value, i.e., carcass quality.

A motor car capable of speeding at 90 miles per hour, but only running 12 miles to a gallon of petrol, and only seating two people, is not so economical in net performance as one which has a maximum speed of 60 miles an hour, petrol consumption of 25 miles per gallon, and seating accommodation for six persons. The same principle applies to pigs, good all-round performance resulting in the best net return being preferable to excellence in one feature at the expense of others. That principle also applies in pig carcass appraisal where body length, ham shape, and correct proportions of fat and lean are all desirable, but a fair balance is preferable to excellence in one and poor performance in another.

That principle is embodied in the awards of this competition, with the provision that a fairly high minimum requirement is set.

Awards were made on the following basis:—

Litter Weight.—One point for every 5 lb. of litter-weight when eight weeks old.

Growth Rate.—The average liveweight in lbs. of the two pigs exhibited from the litter on the day of slaughter, divided by the number of days of their age, and multiplied by 70 in the case of bacon pigs, and by 100 in the case of pork pigs.

Carcass Quality.—Smithfield Appraisal Standard with 100 points maximum.

Eighty pounds (£80) prize money was provided, and was divided into seven prizes for the bacon-pig class, and seven for the pork-pig class, with the condition that, to qualify for a cash prize, an entry must gain at least 175 total points, and 50 points for litter weight, growth rate and carcass quality.

Government certificates of merit were awarded to all entries which gained not less than 200 total points and not less than 60 points for litter weight, growth rate and carcass quality.

An entry consisted of two pigs from one and the same litter. Each exhibitor was allowed two entries which could come from one or two litters. One pig of each entry was slaughtered for carcass appraisal.

There were fourteen exhibits from eleven litters in the bacon-pig class of the competition. All were Large Whites. In the pork-pig class there were ten exhibits from eight litters. Two of the exhibits were Berkshires from one litter, and the others were Large Whites.

In the bacon-pig class, the litter weights at eight weeks old varied from 205 lb. to 465 lb., the live weight-for-age of the bacon-pig entries varied from 151½ lb. at 199 days up to 229 lb. at 172 days, and their percentage points gained for carcass quality varied from 44 up to 76.

In the pork-pig class, litter weights at eight weeks old varied from 255 lb. to 470 lb., the live weight-for-age varied from 64 lb. at 98 days old to 139 lb. at 118 days old, and the percentage scores for carcass quality ranged from 40 to 80.

The average results in all features were good, and it should be noted that under the Smithfield system of carcass appraisal which was used, it is a very good carcass that scores over 60 per cent. Of all the carcasses appraised only two baconers and two porkers scored less than 60 per cent. Three of the porker carcasses were so light in weight as to preclude them from complete appraisal.

Particulars of each entry are given in the tables on pages 497 and 498.

Dairy Supervisors' Examination

An examination for qualification as a Supervisor under the *Milk and Dairy Supervision Act* 1928, will be held in Melbourne commencing 11th February, 1947. Written, oral and practical tests will be held. Candidates must present themselves at the Arts School, University of Melbourne, at 10 a.m. on the first day of the examination.

Entries, with a fee of 5s. must be lodged, on or before 31st January, 1947, with the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2. Entry forms and syllabus are obtainable from the Superintendent of Dairying.

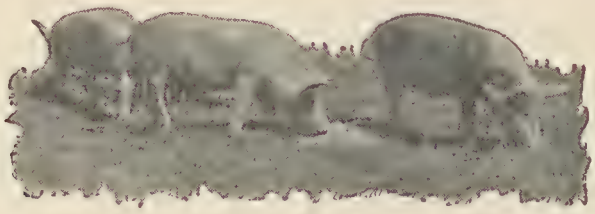
RESULTS OF PIG RAISING COMPETITION, 1946

TABLE 1.—BACON PIG CLASS.

Breeders' Name and Entry Number.	Breeding of Litter.	Litter at Eight Weeks.		Average Live Weight and Age of Two Pigs Exhibited.	Points Scored.				Place and Award.
		No.	Weight.		Litter Weight.	Growth Rate.	Carcass Quality.	Total.	
			lb.	lb.					
L. H. Castle (376) ..	*S.* Promview King 280th .. *D.* Clarendon Superior 9th .. (Large White)	11	465	229 at 172 days	93	93·2	60·5	246·7	1st and G.C.M
L. H. Castle (377) ..	*S.* Promview King 280th .. *D.* Clarendon Superior 9th .. (Large White)	11	465	212 at 172 days	93	86·3	64	243·3	2nd and G.C.M.
Fairchild and Clutterbuck (367)	*S.* Vaucluse Premier 44th .. *D.* Finchley Jewel 232nd .. (Large White)	10	396	237½ at 199 days	79·2	83·5	74	236·7	3rd and G.C.M.
I. E. and F. Hawtin (374)	*S.* Rossmoyne Centurian 37th *D.* Rossmoyne Amy 63rd .. (Large White)	10	407	239 at 185 days	81·4	90·4	61	232·8	4th and G.C.M.
Longerenong Agricultural College (369)	*S.* Longerenong King 88th .. *D.* Longerenong Primrose 152 (Large White)	9	439	211½ at 174 days	87·8	85	53	225·8	5th
Longerenong Agricultural College (370)	*S.* Rossmoyne Centurian 154.. *D.* Longerenong Star 16th .. (Large White)	11	385½	167 at 157 days	77·1	74·5	73·5	225·1	6th and G.C.M.
Fairchild and Clutterbuck (366)	*S.* Vaucluse Premier 44th .. *D.* Finchley Jewel 232nd .. (Large White)	10	396	210 at 199 days	79·2	73·9	67	220·1	7th and G.C.M.
I. E. and F. Hawtin (373)	*S.* Rossmoyne Centurian 37th *D.* Rossmoyne Amy 63rd .. (Large White)	10	407	241½ at 185 days	81·4	91·4	44	216·8	8th
C. T. Harrison (375) ..	*S.* Eastside President 33rd .. *D.* Eastside Maid 103rd .. (Large White)	9	309½	228 at 210 days	61·9	76	76	213·9	9th and G.C.M.
J. Cornell (381) ..	*S.* Rose Valley Prince .. *D.* Promview Superior 126th.. (Large White)	9	357	159 at 164 days	71·4	67·7	69·5	208·6	10th and G.C.M.
F. C. Marriott (371) ..	*S.* Clarendon Renown 3rd .. *D.* Rose Valley Duchess 4th.. (Large White)	10	332	144½ at 165 days	66·4	61·3	75	202·7	11th and G.C.M.
R. D. Simpson (378) ..	*S.* Stanton Vanguard .. *D.* Mountley Moonbeam 2nd.. (Large White)	10	341	151½ at 199 days	68·2	55·5	72·5	196·2	12th
F. C. Marriott (372) ..	*S.* Clarendon Renown 3rd .. *D.* Rose Valley Duchess 7th .. (Large White)	8	320	144½ at 160 days	64	63·2	63·5	190·7	13th
W. Peters (368) ..	*S.* Green Acres Ross .. *D.* Heatherbrae Lass 4th .. (Large White)	8	205	190 at 209 days	41	63·6	68·5	173·1	14th

Table 2.—Pork Pig Class.

Breeders' Name and Entry Number.	Breeding of Litter.	Litter at Eight Weeks.		Average Live Weight and Age of Two Pigs Exhibited.	Points Scored.				Place and Award.
		No.	Weight.		Litter Weight.	Growth Rate.	Carcass Quality.	Total.	
			lb.	lb.					
C. E. and F. Hawtin, (390)	*S.* Wilmot Lance 19th .. *D.* Rossmoyne Sunray 35th .. (Berkshire)	10	470	139 at 118 days	94	117·8	76	287·8	1st and G.C.M.
C. E. and F. Hawtin (391)	*S.* Wilmot Lance 19th .. *D.* Rossmoyne Sunray 35th .. (Berkshire)	10	470	127 at 118 days	94	107·6	80	281·6	2nd and G.C.M.
C. H. Castle (392) ..	*S.* Yarra-Bubba Earl 5th .. *D.* Rose Valley Duchess 2nd.. (Large White)	8	413½	150 at 128 days	82·7	117·2	78	277·9	3rd and G.C.M.
Longerenong Agricultural College (385)	*S.* Longerenong King 88th .. *D.* Longerenong Superior 61st (Large White)	10	371	137 at 135 days	74·2	101·5	71	246·7	4th and G.C.M.
Longerenong Agricultural College (384)	*S.* Longerenong King 88th .. *D.* Longerenong Superior 61st (Large White)	10	371	134½ at 135 days	74·2	99·6	71·5	245·3	5th and G.C.M.
F. C. Marriott (386) ..	*S.* Green Acres Master 5th .. *D.* Green Acres Dorothy 8th .. (Large White)	9	285	95½ at 111 days	57	86	49·5	192·5	6th
W. Peters (383) ..	*S.* Green Acres Ross .. *D.* Heatherbrae Duchess .. (Large White)	7	261½	139 at 143 days	52·3	97·2	40	189·5	7th
F. C. Marriott (387) ..	*S.* Green Acres Master 5th .. *D.* Green Acres Dorothy 9th .. (Large White)	11	306	64 at 98 days	61·2	65·3	Not appraised	..	..
J. Cornell (394) ..	*S.* Promview King 268th .. D. Windrest Delight 2nd .. (Large White)	7	255	75½ at 110 days	51	68·6	Not appraised	..	..
J. Cornell (395) ..	*S.* Promview King 268th .. *D.* Windrest Dolores .. (Large White)	9	306	75½ at 110 days	61·2	68·6	Not appraised	..	..



VEGETABLE GROWING IN THE HOME GARDEN

By GEORGE HYAM .... *Horticultural Supervisor*

The first instalment of this article dealing with general cultivation methods, &c., appeared in the August issue of this *Journal*. The second instalment, published in the October issue, dealt with the cultivation of Leaf Vegetables, Root Crops, Legumes, Salad Vegetables, Tomatoes and Vine Vegetables. Sowing and planting times, recommended varieties, planting details, and pest control will be set out in tabulated form in the concluding instalment of this series.

POTATOES

ON account of the usually plentiful supplies of commercially grown potatoes, and the fact that they lose little of their food value through storage, potatoes are not an economical crop for a small garden, except perhaps for a few rows of early potatoes which will be dug in time to replant the beds with summer crops. Potatoes are very useful for planting in new soil preparatory to other vegetable crops, and in large gardens a potato crop will keep otherwise unused ground from becoming weed infested and keep it in good heart for future vegetable crops.

Commercial supplies of potatoes are usually at their lowest during November and December, so that where it is possible to grow them for use at this time, they have their place in the garden. Room can sometimes be found for a late autumn crop planted in February. Potatoes are frost-sensitive and even the earliest crops cannot be planted before July—August with safety, and in cooler districts planting has to be delayed still later. The first essential is to secure disease-free seed sets, and it is thus advisable to plant the "Government Certified" strains. All seed sets should be "greened" before planting. The seed should be secured some weeks before planting, placed on a tray and exposed to full light away from frost. The main eyes will develop into short sturdy shoots and the skins will harden and turn green. If kept in the dark the shoots will become long, weak, and spindly, and the vigour of the set will be lost through over-development of many shoots.

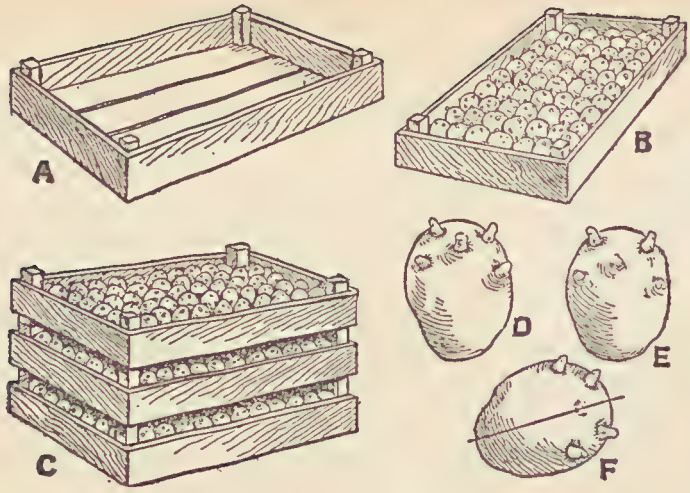
In saving seed sets from a previous crop select tubers from plants that show no signs of disease, and that have produced a reasonable number of fair-sized tubers. Home-saved sets should be exposed to the light from the time of lifting until planting time.

Large tubers can be divided just before planting, each piece to have one or two good eyes. Whole potatoes, not more than 2 inches in diameter make the best sets.

Potatoes do best in soil which has been well manured with organic manure for a previous crop and they do well after leaf crops or legumes. They should not be planted after tomatoes. No lime should be applied just prior to planting.

In the home garden it pays to spray or dust the plants with Bordeaux or a fungicidal dust, at fortnightly intervals, commencing when the plants are 7 or 8 inches high.

As a guide to whether potatoes are worthwhile in a small garden it may be said that a reasonable crop prospect under garden conditions in properly prepared soil is as follows:—An area 12 ft. 6 in. x 10 ft. will allow five rows 2 ft. apart. Ten lb. of seed (averaging five sets to the lb.) will be required, and a crop of from 50 to 60 lb. in weight can be expected if proper cultural conditions have been given.



Potato sets should be "greened" before planting. A, B, C—Greening trays. D, E.—Sets over 2 inches in diameter should be cut as shown, F.

earthed up round the plants. Little or no water will be needed for early crops if the spring rainfall has been normal.

Harvesting

Potatoes may be dug as "new" potatoes shortly after flowering before they have reached full development, but they will not store at this stage. Potatoes required for storage should not be lifted until the foliage has started to yellow, or they may be left in the ground until the foliage just dies down, but not longer, as otherwise they may sprout again. Before storing, allow the tubers to dry off in the wind, on the surface of the ground.

Soil Preparation

Dig the plot over a week or two before planting. This need not be worked down to seed-bed conditions, but just roughly levelled. V-shaped furrows, about 4 or 5 inches deep should be formed with a hoe, and along this, a week or so before planting, distribute superphosphate, sulphate of ammonia, and sulphate of potash (3–1–1) at the rate of ½ lb. to 10 ft. of furrow. Work the fertilizer into the furrow so that it is not in direct contact with the sets when planted.

Planting

Place the sets in the bottom of the furrow, shoots uppermost, about 14 inches apart and cover them with at least 4 inches of soil.

Planting dates vary considerably, depending on the frost period for the district, and local experience should be sought as to the earliest safe planting-time. In the Melbourne metropolitan area, it is fairly safe to plant early in July in the sandy coastal areas, and August in the higher and heavy soil districts. In many hill country districts it is not safe to plant before October or November.

Cultivation

As soon as the shoots appear above ground, hoeing between the rows should be commenced, drawing the soil towards the plants but not so as to bury them. Final hoeing should be at the flowering stage when all available soil between the rows should be

Treatment of Potato Sets

Disease control is helped by dipping the sets in "Aretan," or a solution made up of 2 oz. of 40 per cent. formalin in 15 pints of water for a period of two hours.

ONIONS

Onions are adaptable to any ordinary garden soil and climate but care must be taken to plant only the variety suitable for the season. If a variety is planted too early, they are apt to fail to form bulbs; if planted too late, only small bulbs will be formed. The early "silverskin" and flat white onions do not store well, and are usually grown for use in the spring and cooked when the foliage is still green, so that plantings of these should be smaller than for the keeping kinds. The mid-season Globe and Odourless varieties will store to some extent, but plantings of these should be restricted to sufficient plants to provide bulbs for use until the late keeping onions —like Australian Brown (sometimes misnamed "Brown Spanish") and White Imperial—are ready in February. Sufficient of the keeping kinds should be planted to last from February to November.

For garden crops, onions are best raised in seed beds and transplanted when 6 or 8 inches high. The seed will take about ten weeks to reach planting-out stage, and the seedlings will still be at planting-out size for some weeks after that. Surplus seedlings can be used for salads as "spring onions."

After lifting, the roots and tops are cut back.

Onions do best in deeply-worked soil, but before planting, the bed should be firmed down. The beds for onions do not need heavy manuring before planting, especially if they follow leaf crops. Blood and bone is the best base manure for them. Side dressings of nitrogenous manure supplied just as the bulbs are being formed will increase size, but over-feeding causes thick necks and seed heads to form. Onions can be planted after any other vegetable.

Potato and tree onions are grown from small sets saved from the previous crop—like shallots. The Potato Onion forms a cluster of small bulbs just beneath the soil surface. The Tree Onion develops a bulb but also produces small bulblets in a cluster on long stems. A few plants of either of these are handy in the home garden for flavouring and for pickling, and as they require no special soil conditions, they can be placed in the herb garden with shallots, the cultivation of which will be described under that heading.

Pickling onions are merely the small bulbs of any variety of onion.

Soil Preparation

Deep digging is desirable. In deep, friable soils, onions will root deeply and form better bulbs. Use only blood and bone manure as a base fertilizer, placing it in double bands each side of the row at the rate of 1 oz. for every 6 ft. of row. Firm down the surface by trampling before planting.

Planting Out

Place the seedlings in dibber holes about 1 inch deep, taking care that the soil is pressed firmly around their roots. Watering is necessary only if the soil is dry. Observe the correct spacing, otherwise only small bulbs will be formed.

Cultivation

Weed growth must be kept down but the hoeing between the rows should be shallow. Watering is seldom necessary except in northern areas, and when the bulbs have started to form, watering should cease. Heavy watering at this stage may cause mildew or restrict the storage capacity of the bulbs. When the bulbs commence to form, apply liquid sulphate of ammonia (1 oz. to gallon) twice, at intervals of one month.

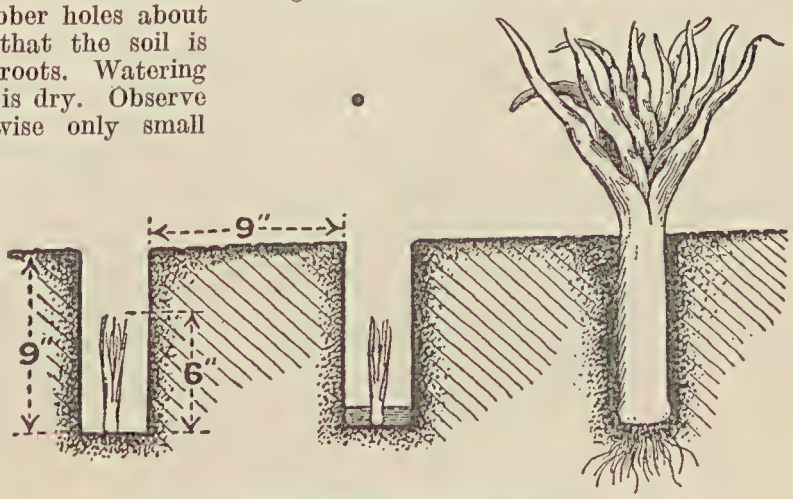
Harvesting

Onions can be lifted while the foliage is green for immediate use. For storage, the tops should be allowed to wither, and after lifting, the bulbs should remain on the surface of the ground to cure for some days until the foliage is quite dry, and capable of being broken off from the bulb. The best method of storage will be described later.

Seed treatment is not necessary for onions.

LEEKS

Although the leek is a member of the onion family, its cultivation is not the same. The edible portion is the long white stem which has only a slight bulbous formation at the base, together with a small portion of the young and tender green leaf. To ensure the greatest amount of blanched stem, leeks should be planted deeply in trenches, or earthed up during growth, and to promote succulence they need much heavier manuring than onions. In many ways leek cultivation is similar to that used for celery. Nevertheless, the leek is very hardy and adaptable to any soil, but quality depends upon the way it is fertilized. Without ample feed, the plant will be unattractive as a vegetable dish, being coarse in texture and comparatively flavourless. Leeks are a splendid crop for the home garden as they have a very long period of use and a high food value. Small leeks, just a little



A simple method of planting leeks in the home garden.

further advanced than the seedling stage can be used in salads, and they are usable for cooking, even when they are only ½ to ¾ inch in diameter, until they reach a diameter of 2 or 3 inches.

Large leeks can be just as succulent at this stage if they have been grown on without check due to lack of manure or water. The whole period of use is thus extended over three months or more when the crop is planted at the proper season.

Leeks are always raised in seed beds and transplanted. Leek seed takes four to five months to reach transplanting size. Seedlings are raised in drills in the same way as for onions. The main planting months are January and February, the seed having to be sown in August or September for this planting. They will reach full maturity in about 25 weeks from planting, but can be used from about the thirteenth week onwards.

Leeks are very free from insect or disease troubles.

Soil Preparation

The soil cannot be made too rich. Dig into the lower layers at least 4 inches of stable manure or 2 or 3 inches of compost along the position of the rows. In addition, work into the upper soil the equivalent of 3 oz. of blood and bone or market gardener's manure to the square yard.

Planting

The best planting size is when the seedlings are about 8 inches in height and the thickness of a lead pencil at the base. There are several methods of planting. A deep trench is taken out as for celery, and the plants are inserted along the bottom. The trench is left open for the first few weeks, and as they grow the soil is gradually drawn up around the plants.

The trench method is advantageous for summer planting as the trenches can be flooded, giving the heavy watering leeks need in hot weather. Another good method in the home garden is to make dibber holes about 1 inch in diameter and at least 6 inches deep. The plant is dropped into these holes, with a little soil filled in—sufficient to cover the roots—and the hole is afterwards filled with water. The plant soon roots but the soil is not packed round the stem of the plants until the foliage has grown to a height fo 3 or 4 inches above soil level. If leeks are planted on the level like onions, sufficient space between the rows has to be left to provide soil to earth them up so that at least 6 inches of their stems is blanched. About 5 or 6 inches is the usual space between plants, but if large plants are wanted, they are spaced up to 12 inches apart.

Cultivation

Keep the rows weeded. Apply liquid manure every fortnight after the plants have been in the ground for two months. Keep the soil around them moist during hot weather.

Harvesting

Lift as required from the time the plants reach usable size. Leeks will not retain their succulence outside the soil. Trim off the coarse outside leaves, but retain as much of the young tender inside leaves as possible. The green leaves of leeks have much the same dietetic value as leaf vegetables, and the white portion has a similar value to that of onions.

Seed treatment is not required for leeks.

CELERY

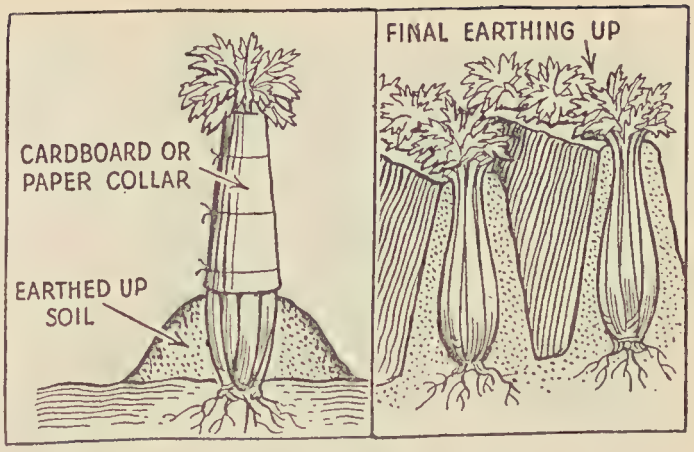
Celery is probably the most difficult vegetable for the home gardener to grow. It never grows as well in hot as in cooler districts, and it requires a deep soil which has been heavily enriched with organic manure. Celery does not respond to artificial fertilizers, except as side-dressings during growth. For salads, celery should be planted in trenches so that the soil can be gradually filled in around the row as the plants grow, keeping it just below the leaves. This blanching can also be done by planting celery in level beds in close double or treble rows, and then fixing wide boards close to each side of the outer row when the plants are about 10 inches high. Other methods are to wrap several layers of newspaper around each plant or place 4 inch diameter earthenware drain pipes over each plant, three or four weeks before the plants are large enough to use.

Even the so-called "self-blanching" kinds will grow green outside stems unless they are blanched in some way, but this type is satisfactory to grow without blanching, if the main use is for cooking. A few of their inner stems will be crisp enough for salad use. Considering the length of time the crop takes to mature, and the work and care involved, the growing of celery should be confined to the larger gardens

in the southern areas. Celery should not follow leaf crops, tomatoes or potatoes in the garden rotation.

Soil Preparation

Dig a trench 15 inches wide for a single, or 18 inches for a double row, 8 to 10 inches deep, and at the bottom of this, fork in a 4 to 6 inch layer of stable manure. Allow plenty of room each side of the trench to provide more soil for earthing up, unless the other methods of blanching are to be used. Level beds should have a similar quantity of manure, dug in under the row.



Two methods of blanching celery.

Sowing and Planting

It is better for the home gardener to purchase plants, as the raising of celery seedlings is very slow unless done under glass. The seed is usually germinated under glass and the seedlings pricked out as for tomatoes. Single row planting is usual for earthed-up plants or for those blanched with paper or pipes. Close double or treble rows are planted when boards are used for blanching. Break off the short sucker stems before blanching by any method.

Cultivation

The main work is providing plenty of water during growth. The plants must never be allowed to become dry. Side-dressings of superphosphate and sulphate of ammonia (4 parts to one part) should be applied in monthly intervals from six weeks after planting, using 1 oz. to 6 ft. of row. The plants must be dusted or sprayed during the early stages of growth with Bordeaux, Cuprox, or with one of the special fungicidal dusts applied once a month to control "rust" and "spot."

Harvesting

The whole plant is lifted. A few leaves of the growing plants may be picked for flavouring soups and stews, without detriment.

Seed Treatment

Unless celery seed is hot-water treated, the plants are almost sure to be affected with rust, spot, or mildew.

For general cooking purposes and for flavouring, the home-gardener would be well advised to plant *Celeriac*, the turnip-rooted celery, which has a bulbous base and does not grow tall. The flavour when cooked is that of celery, the thickened part being cut up like a turnip. Its soil requirements and cultivation are the same as for celery, but no blanching is necessary, except by drawing soil around the base as it develops. *Celeriac* is more adaptable to soils and climate, and less subject to disease than celery.

CAPSICUMS OR PEPPERS

The value of green capsicums as a salad is being increasingly recognized and fresh red capsicums have a place as an ingredient of made-up dishes. When dried, the fruits of the hot red capsicums or chillies are useful to add to sauces and pickles. Capsicums are classified into "sweet and mild" and "hot" varieties which describes their flavour. The "sweet and mild" varieties are mostly used raw when in the fresh green stage, principally for salads, and the "hot" varieties are usually dried and then used for flavouring at any time of the year. The cultivation of capsicums is the same as for tomatoes, but they should not be planted out too early, as they are extremely frost-sensitive. Seed can be sown in a seed-bed and transplanted as for tomatoes, or the seed can be sown direct in the beds. Capsicums need a warm sunny position, protected from heavy winds, as their stems are brittle and easily broken.

Soil Preparation and Planting

Dig and manure as for tomatoes. Transplant from the seed bed when 3 inches high,

Fruits of Capsicums. The "bull-nosed" varieties are used for salads; the long varieties for flavoring.

watering the plants in with the nutrient solution, as for tomatoes. Alternatively, sow three or four seeds direct, where one plant is required, spacing them 20 inches apart, afterwards selecting the best plant and removing the rest when three inches high.

Cultivation

Keep weeded. No pruning is necessary. For continuous cropping, water with liquid manure every fourteen days from the time the first fruits appear. Keep the soil moist but do not overwater.

Harvesting

For salads, pick in the immature green stage. For flavouring, allow the pods to colour; for drying, pick when fully coloured and when the pods are starting to shrivel. The pods are dried by threading on strings and hanging them up in an airy shed.

Dust the seed with Cuprox or Oxi-cop as for tomatoes.

THE EGG PLANT

The Egg Plant, which is also known as the Aubergine, is now seen for sale in Melbourne in season, the supplies generally coming from the northern States. They will flourish in any district in Victoria that is free from frost from October to April. In general, their cultivation is the same as for tomatoes and capsicums. Plants can be raised from seed under shelter for early planting or the seed can be sown in groups of three directly in the beds, afterwards thinning them out to one plant for each stake.

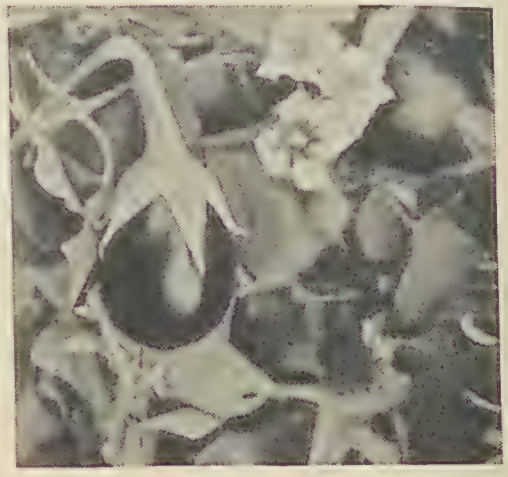
The fruit resembles a small black or purple coloured squash, but with a softer skin or rind. Egg fruits can be served in many ways. One method is to cut them into thin slices, crosswise, and after dipping the pieces in salt, these are fried in batter and served with bacon. Their flavour is not unlike that of fried egg and from this characteristic the egg plant has derived its name. Egg fruit can also be boiled, baked, and roasted in a manner similar to that used for pumpkin or squash and served with any meat dish. They may also be stuffed with meat and seasoning like vegetable marrows.

Soil Preparation and Planting

Prepare and manure the soil as for tomatoes. Sow the seeds in seed boxes or beds for transplanting, or directly in beds in groups of three, spaced 2 ft. apart, thinning out to one plant when 3 inches high. Sowing direct in the beds is to be preferred as there is some loss in transplanting, unless pricked out in pots or tins. Four-foot stakes should be provided for each plant.

Cultivation

Avoid overwatering when in the seedling stage, gradually increasing the moisture as the plants come into fruit. Fertilize during growth as for tomatoes. Pinch out the centre when 6 inches high and tie to stakes as they grow, as for tomatoes. An egg plant will normally carry eight to ten fruits, but it is best to restrict the fruit to four or



Egg Plant (Aubergine).

[After Hawaii Agr. Bull. 91]

five per plant to avoid production of small undersized fruit.

Harvesting

The fruit is gathered, when fully coloured, by cutting with a small piece of stem attached. The fruit should not be allowed to become overmature, which is indicated by a slight shrivelling, at which stage they are seedy. The fruits will keep without special storage for three or four weeks after picking. Dust the seed with Cuprox or Oxi-cop as for tomatoes.

Sweet Corn makes an excellent wind-break for other vegetables.

SWEET CORN

Sweet corn is becoming increasingly popular both as a fresh vegetable or when canned. For use in the fresh form, home-grown and freshly-picked corn has the advantage over cobs purchased in shops on account of their tendency to continue to ripen after picking. For quality, the stage when the cobs should be picked is very critical, and the sooner they are cooked after picking, the better the flavour. On account of this quick deterioration both on and off the plant, it is advisable to make successional plantings. Sweet corn can be planted from seed from the end of September until December, the cobs being ready for use in about two and a half months. Better filled cobs will be produced in the home garden if pollenization is assisted by shaking the pollen off the top tassels when ripe, on to the protruding "silk" of the immature cobs on adjacent plants.

Soil Preparation

Dig and manure as for tomatoes. Apply 1 oz. of superphosphate per 3 ft. of row in double drills alongside the seed row. Sow the seed in drills 1 inch deep for early sowing and 1½ inch in depth for sowing from November onwards. Place three seeds in a group every 12 inches along the drill and thin out to one plant when the plants are about 8 inches high. Allow 3 feet between the rows.

Cultivation

The soil should be kept in good tilth between the plants and rows, gradually earthing up around the plants until they are on a small hill. Apply liquid manure or sulphate of ammonia when the top male flower or "tassel" is starting to form. Assist pollenization by shaking the pollen from the tassel on to the "silk" of the cob when the air is quite still, preferably in the evening or early morning. Water heavily in the hot weather.

Harvesting

As the cobs commence to swell they must be watched closely to avoid over-maturity. The cobs will be ready for use when the top tassel starts to wither, and the cobs themselves are plump. An additional check is to open the sheath of the cob and prick some of the kernels with a pin. They should exude a milky juice and feel quite soft when pressed with the thumb-nail. If juice does not exude, the cob is over-mature and its flavour will be inferior when cooked. Cook as soon as possible after picking as the cobs may become over-mature if held for 24 hours after picking. Pull or cut off the cobs with a downward motion. When cooking, see that the water is boiling before the cobs are placed in the saucepan.

ASPARAGUS.

Asparagus is usually considered to be a luxury vegetable, but actually it is quite an economical vegetable to grow in the home garden on account of its sustained yield from a comparatively small area. Asparagus is a perennial and if it is properly planted

Harvesting sweet corn. Cut or pull off the cob as shown.

[After "Vegetable Growing," Penguin series.]

in the first instance, and the beds are well fertilized every season, an asparagus bed will last from fifteen to twenty years at least.

Asparagus is adaptable to most types of soil, but does best in a sandy loam. In heavy soils inclined to cake the sticks will be crooked and distorted. In such soils, it is better to cover the plants with a mixture of loam and sand.

Asparagus beds must be well drained, and the season will be prolonged, and the yield will be better, if the beds are where they get the full sunlight. The beds should be 4 ft. wide with a 2 ft. alleyway between them. Each bed will take two rows of plants. The soil should be trenched to a depth of at least 2 ft. and if the subsoil is heavy this can be improved by digging in some sand.

A large quantity of organic manure should also be incorporated in the lower layers of the bed; a 10-inch layer would not be too much. The top soil should be dressed with 4 to 8 oz. of blood and bone per square yard, and this should be forked in at the time of planting.

Proper preparation of the soil is most important to the future development and yield of an asparagus bed and any skimping of this work is hard to correct later.

Planting is done from June to early August, but the trenches for a new plantation should be prepared some weeks beforehand. Asparagus beds may be planted out with one- or two-year-old crowns but a cheaper and better way is to raise the plants from seed. The seed is sown in August or September, in drills 1 inch deep in any convenient place, without any special soil preparation. They germinate readily if the seed is soaked in water overnight before sowing. The plants should be thinned out to 3 inches apart at an early stage. As they grow, it will be seen that the foliage varies. The male plants grow taller with their foliage starting higher up the stems; the foliage of the female plants grows almost to ground level. More sticks are obtained from male plants, so these should be retained for transplants, when thinning. The young plants may be planted in the permanent bed during their first winter, but it is better to wait for another year, because of the fact that, during the second year, the sex of the plants may be more easily distinguished. During the second summer, the female plants will bear seed-berries and it is best to reject these.

When planting the permanent bed, trenches, about 8 or 9 inches deep, 10 inches wide with an 18-inch space between them, should be dug along the centre of the bed. Along the bottom of these, build a small ridge of soil. The crowns, which have spider-like roots growing around them, are straddled over this ridge, and the fleshy roots arranged evenly and pressed downwards, spacing each crown 15 inches apart. The top soil is filled in so that there there are at least 5 or 6 inches of soil above the crowns.

For the first two seasons, the plants are allowed to grow without cutting if one-year-old plants are used, the only cultivation required being the elimination of weeds. During the winter, the dead foliage is cut off, at ground level, the soil dressed with blood and bone, and lightly forked over. Sticks can be cut during the third season

until the middle of November, after which the foliage should be allowed to develop to die down naturally in the winter. Throughout the life of the bed, asparagus should receive a heavy dressing of fertilizer in the winter when the soil is forked over after removing the dead foliage, and when cutting starts in the spring, weekly applications of liquid manure will keep the bed in good profit.

If two-year-old plants are planted, light cuttings may start the second season after planting. Beds that have been planted for three years or over may be cut until the middle of December, when all sticks should be then allowed to develop foliage again. Cutting sticks after this will weaken the crowns and lessen the ensuing crop.

Yield is largely determined by the amount of feeding the beds receive. It is almost impossible to overfeed asparagus.

The varieties most favoured are Mary Washington and Conover's Colossal. It is a matter of choice whether white or green sticks are to be preferred. If the former are wanted, the beds are earthed up by using the soil from the alleyways between the beds to a depth of 8 or 9 inches above surface level. For green sticks, the beds are kept at the original level.

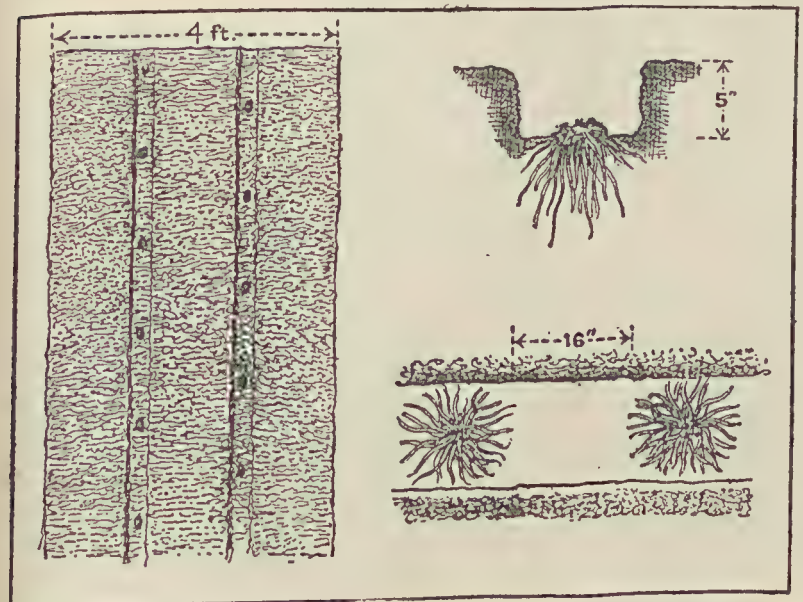
A plot about 12 ft. x 15 ft., containing about 50 or 60 plants will produce 1,000 sticks during the season from an established and well-manured bed, or the equivalent of three cuttings a week from September to the middle of December. Yield is also influenced by temperature and moisture during the cutting season.

Soil Preparation, Planting and Cultivation

Trench deeply and manure heavily as described previously. Plant selected male plants. An annual forking over of the beds after the old foliage is removed, incorporating manure or fertilizer, into the top soil is essential. Beds are then earthed with a view to producing blanched sticks. Weeds are removed when cutting is being done during the season. Weekly applications of liquid manure should be applied when cutting. No salt dressing is necessary, but as asparagus is salt-tolerant, light dressings of salt can be used in the spring to supress weeds. Keep the beds moist to increase yield.

Harvesting

Cut below the soil, preferably with the special asparagus knife. To avoid damaging latent shoots insert the knife at an angle; hold the stick to be cut with the left hand and don't cut until the knife comes into contact with its base. Cut blanched sticks as soon as they appear through the surface, and green sticks before the leaf scales open. For quality, cut the sticks just before cooking. No sticks should be allowed to develop foliage during the cutting period. If sticks are to be held before cooking, their cut ends should be stood in water.



Method of setting out a bed of asparagus. Roots should be spread and pressed downwards as described in text.

RHUBARB

Rhubarb, being a perennial plant, does not come into any garden crop rotation, and a special bed should be prepared for it in a place where it can be allowed to remain for some years. Like all perennial plants success in growing rhubarb depends largely on the initial preparation and building up of the

Harvesting rhubarb. Outside stems should be pulled off with the sheath attached.

soil before planting. A large quantity of organic manure should be worked into the lower layers of the soil, out of the range of the roots of newly planted sets.

The sets should be the outer pieces of an old clump which have one or two buds on each, and these buds should be at soil level after planting. Rhubarb must be planted during the winter months.

No stems should be pulled for the first year after planting, and pickings should be light during the second year.

Good drainage and heavy annual manurial dressings will keep the plants producing, but after the fifth year from planting the crowns should be lifted, divided and replanted, using only the younger outside buds for replanting.

Most varieties do not produce stems all the year round but there are varieties which can be picked during the winter, spring and summer respectively, so that the rhubarb bed should have some plants of each of these to provide a continuous supply.

Rhubarb can be grown from seed, but seedlings are not always true to type. Where it is difficult to get sets, seed can be sown during the winter and transplanted in the spring. They will grow sufficient stem to allow their quality to be assessed, and those selected can be allowed to grow on for another season before setting out in the permanent beds. Where obtainable the planting of sets is the most satisfactory method in the home garden.

Soil Preparation.

The rhubarb bed must be well drained. The bed should be trenched before planting, even if the ground has been trenched before. When stirring the subsoil, as much organic manure as can be spared should be dug into the subsoil and the lower topsoil. A 6 to 8 inch layer would not be too much. A liberal dressing of blood and bone should be worked into the upper soil.

Planting

The sets should be obtained from a reliable source so that the right seasonal varieties will be planted. Plant the sets on raised banks about 18 inches wide and 8 to 10 inches high, at a depth which will bring their buds just above soil level after allowing for settlement of the surrounding soil. Space the plants 2 ft. 6 inches and the rows 3 feet apart.

Cultivation

The main care that rhubarb requires is heavy feeding during the winter. Apply 4 oz. of blood and bone to the square yard around the plants, and fork into the soil. This should be supplemented during the growing season by frequent applications of liquid manure. A mulch of organic manure applied when the stems are forming, and maintained during the summer, will produce good crisp stems. Rhubarb should be watered liberally in summer and this is best applied by overhead sprinkling. Break off any flower

bud as soon as seen. Flower development exhausts the crown.

Harvesting

The stems, which may be picked at any stage, should be taken with a downward pull so that they come away from the crown without leaving a stub. Pick the outside stems first, always leaving some of the centre stems to protect later shoots. Unwanted stems should be allowed to mature on the plant, and seasonal picking should cease when the later stems deteriorate in size. The plants should never be completely stripped of stems; some must be allowed to remain to mature naturally.

Treatment of Sets

As old crowns develop decay and rots to some extent, it is advisable to dip sets taken from them in a fungicide spraying solution, such as Bordeaux, Cuprox, or Oxicop before planting.

THE ARTICHOKES

There are three kinds of artichokes: the Jerusalem, Chinese and Globe. Jerusalem artichokes are the best known in this State and they are valued as an addition to the somewhat limited range of vegetables which are at their best during the winter months. Jerusalem artichokes are always grown from tubers planted out in July and August in a similar way to potatoes. They will grow in almost any soil, but if they are manured in the same way as for potatoes, they develop larger and smoother tubers. Jerusalem artichokes do not store well, so their use is limited to the period from when their foliage dies down in late April, until they sprout again in early September.

They are best planted each year but a permanent bed can be made by leaving odd tubers behind in the soil to grow in the following season. In this case, the plants should be thinned out after they come through the ground if they are overcrowded, and the bed should be top-dressed annually with blood and bone manure. Jerusalem artichokes are a good breakwind for other crops, as their flowering stems will grow to a height of 8 ft. during the summer months. They are a species of sunflower and have quite attractive flowers.

The Chinese Artichoke is also grown from a tuber planted during August, when it is planted like the Jerusalem species, except that it is best planted in ordinary garden soil without manure, otherwise the foliage tends to become rank to the detriment of the tubers. The tubers have a curious cork-screw-like shape and have a different flavour to the Jerusalems. They do not store out of the ground, and if they are exposed to light and air for an appreciable

The artichokes. Left: Jerusalem. Top: Chinese. Right: Globe.

After W. Brett.]

time before cooking, they become discoloured and inedible.

The Globe Artichoke is an entirely different plant, and is the only true artichoke. Although it is not well known here, it may be said to be one of the luxury vegetables if it is picked at the right time and cooked properly. Globe artichokes are perennial, making a bushy plant about 5 ft. high, which looks like a large thistle. The edible portions are the globe-shaped, half-grown flower heads and their fleshy bases, and these are picked when most of the scales are unopened and of a bluish-green colour. Their season extends from December to April, but the heads will not store for long. Globe artichokes are quite decorative, and are not infrequently grown in flower beds.

The attractiveness of all the artichokes is often spoilt through faulty cooking methods and some hints on treating are included hereunder.

Soil Preparation and Planting

Jerusalem Artichokes.—Dig deeply and manure as for potatoes. Select medium-sized smooth tubers for planting during July or August, spacing them 18 inches apart and 6 inches deep.

Chinese Artichokes.—Dig deeply, plant without manuring, 3 inches deep and 12 inches apart.

Globe Artichokes.—Unless suckers from old plants can be obtained seed should be raised in a seed-bed, sowing early spring and transplanting when the plants reach the same size as cabbage transplants. Suckers can be planted when 9 inches high, in early spring, on soil that has been prepared as for vine vegetables, with plenty of organic manure placed under each plant. Three or four plants will suffice for the ordinary household. Replant from suckers every second year.

Cultivation

For Jerusalem and Chinese artichokes no special cultivation is necessary, except to earth up the plants a little as they grow. Globe artichokes during the summer should be watered every fortnight with nitrate of soda or sulphate of ammonia, 1 oz. to the gallon, using ½ gallon to the plant, as the flower stems form.

Harvesting

Jerusalem and Chinese artichokes can be lifted as required as the foliage dies down, and both are superior in flavour if lifted just before use. Dig as for potatoes, and except for permanent beds, see that no tubers are left behind. Globe artichoke heads are cut in the tight bud stage together with an inch or two of stem, just as the lower scales are beginning to open. As soon as the buds have been taken, the flowering stem is cut back to induce more shoots to form. Pick the heads just before using.

Hints on Cooking Artichokes

Cooking quality is largely a matter of freshness, and no sprouted tubers should be used. Jerusalem and Chinese artichokes should be washed and scrubbed under water, to which two or three teaspoonfuls of vinegar have been added to remove the skins. The Jerusalem variety should be cooked gently for at least 30 minutes in boiling water, with an onion and some salt, serving mashed or whole with white sauce. They can also be baked after having been immersed in boiling water for a few minutes and they make a delicious soup. The Chinese artichoke is cooked in a similar way for about 20 minutes. Globe artichokes should be prepared by having any rough scales cut away, and then washed well in salted water, afterwards cooking for at least 30 minutes in boiling water or until tender. They are usually served with melted butter as for asparagus.

The foregoing is the third instalment of an article dealing with the growing of vegetables in the home garden. Further instalments will appear in subsequent issues of the Journal.

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.
Live Stock Science Officer

NEW HERD SIRE FOR DOOKIE

THE Polled Hereford bull "Moreduval Darby" has been purchased from Mr. Geoffrey G. Howell, "Munorhara," Woolert, for the Polled Hereford stud at the Dookie Agricultural College.

At the Melbourne Royal Show there was a strong section of Polled Herefords and in a class of six good young bulls born between 1st September, 1945, and 2nd March, 1946, "Moreduval Darby" was awarded Second Prize.

The pedigree of "Moreduval Darby" is as follows:—

MOREDUVAL DARBY (C.R.)
Born: 15th September, 1945
Bred by R. Simson, "Moreduval," Quirindi, Queensland

- MOREDUVAL BANKER 2ND (656)
  - PAWNEE ROLLS 38TH (Imp. U.S.A.)
  - LENA BULLION (Imp. U.S.A.)
- MOREDUVAL FAIR JOAN (831). Reserve Champion at last Sydney Royal Show
  - PAWNEE ROLLS 38TH (Imp. U.S.A.)
  - ME MEL SWEET LAVENDER

The Dookie Agricultural College Polled Hereford stud was commenced in 1938 when the bull "Royal Gem 23rd," bred by Mr. F. E. Humphreys, Gisborne, New Zealand, was purchased from Mrs. H. M. Kilpatrick, Deniliquin, N.S.W., to mate with the Hereford cows which had been bred from Treverder, Hobartville, Coliban, Golf Hill, and other high-class stock. "Royal Gem 23rd" left very good progeny in the Dookie herd, but died in 1945 when thirteen years old.

In 1942 "Cudgeena Beauworth 55th" was purchased from Mr. L. F. Leake, "Cudgeena," Cudgewa, to mate with heifers by "Royal Gem 23rd." "Moreduval Darby" will be used on heifers by "Cudgeena Beauworth 55th."

The "Dookie" Polled Hereford Stud is maintained largely for demonstrating the qualities of beef cattle and their management and the principles of beef production to the College students. Each year from ten to twenty young bulls are reared and are available for sale to breeders and beef cattle producers.

DAIRYING

For many years now, dairy farmers have realized that vegetable fats are strong competitors with butter and that the low cost of producing margarine from these vegetable fats is a serious threat to the dairying industry. Reports from the United States of America indicate that vegetable proteins are also likely to be serious competitors with other forms of dairy produce. Soya-bean protein is very cheap and as a supplement to cereal protein gives growth rates comparable with those received from milk proteins. In the United States, 36 per cent. of the protein produced for human consumption is obtained from milk, presenting a big field into which competitors may penetrate with vegetable proteins.

The cost of milk protein in dollars per

pound is shown to be 0·42 for dried skim milk, 0·96 for fresh whole milk, and 1·11 for cheddar cheese as against a cost of 0·09 dollars for each pound of soya-bean protein.

It has been calculated that one acre will produce 39 pounds of milk protein or 339 pounds of soya-bean protein and that the labour required to produce 89 pounds of milk protein is capable of producing 2,821 pounds of soya-bean protein.

Dairy farmers and others connected with the industry have to recognize that soya-bean protein as well as soya-bean oil is a competitor with dairy products.

CHAMPION BUTTERFAT AND MILK TEST

The Kraft Walker Champion Butterfat and Milk Test conducted over three days at the Melbourne Royal Show attracted only four competitors from the eleven nominations originally made. The four cows were "Devon Park Victorious Madeira," Jersey, bred and exhibited by Devon Park Stud Farm, Lilydale; "Yarra View Ruby," Guernsey, bred and exhibited by Mr. A. E. T. Payne, Lilydale; "The Forest Champion," Australian Illawarra Shorthorn, bred and exhibited by Mr. A. C. Jones, Barnawartha; and "Wattle Bank Sandhurst 2nd," Friesian, bred and exhibited by Messrs. R. W. Smith and Son, Koo-wee-rup.

The production of these cows was as follows:—

Name of Cow.	Milk.	Butterfat.	Value of Production.
	lb.	lb.	s. d.
"Devon Park Victorious Madeira"	103·45	9·472	19 6·132
"Yarra View Ruby" ..	156·05	6·333	14 2·691
"The Forest Champion"	164·85	6·050	13 10·226
"Wattle Bank Sandhurst 2nd"	175·85	5·689	13 2·167

GOATS AT THE ROYAL SHOW

Goats were exhibited at the Melbourne Royal Show this year for the first time. In all, thirteen entries were made by five breeders, and all were Saanens. The most successful exhibitor was Mrs. Helen Grayson, Heidelberg, who showed the champion buck "Sarona Victor Magnate" and champion and reserve champion does, "Artlunga Snowdrop" and "Branxholme Beryl." Mrs. P. M. Keighran, Montrose, received the reserve championship award for her buck "Braedene Belmont."

The goats were housed opposite the cows entered in the Kraft Walker Champion Butterfat and Milk Test and while this test was being carried out two of the does were tested over a 24 hour period. Neither doe was milking at her top but both produced over 2½ quarts of milk and one-third of a pound of butterfat in the 24 hours.

The doe "Dalorna Bellatone," exhibited by Mr. E. J. Crafter, Croydon, produced 6½ lb. of milk with a 5·62 per cent. butterfat test and 0·365 lb. of butterfat. The reserve champion "Branxholme Beryl" produced 7 lb. of milk with a 4·78 per cent. test and 0·335 lb. of butterfat.

The goat "Merrivale Beauty" with her two kids born at the showgrounds and exhibited by Mrs. A. E. Bridgford, Mitcham, attracted most attention.

The Department of Agriculture of New South Wales is herd testing pure-bred Saanen does in the same manner as cows are herd tested. Last year 30 does completed their 273 days' test. The highest butterfat producer was "Radiance," owned by Mr. A. T. Gregory, Bankstown, N.S.W., which produced 2,888 lb. of milk, 4·7 per cent. test and 136 lb. of butterfat as a junior-three-year old. Incidentally "Radiance" is the dam of "Merylah Max" a buck under one year old, owned and entered at the Melbourne Royal Show by Mr. E. T. Morgan, Tullamarine, Victoria.

Amongst the 30 does tested in New South Wales were three which produced over one gallon of milk per day, eight averaged between three quarts and one gallon per day during the nine months, and fifteen averaged between two and three quarts per day. One junior yearling doe produced 2,483 lb. of milk during her lactation. The average butterfat percentage of the milk produced was about 4·3 per cent. One doe averaged 5·0 per cent. and five of them averaged less than 4·0 per cent.

CATTLE COMPENSATION AND SWINE ACTS

Stamps must be Attached to Statements of Sale

Within seven days of selling cattle the vendor must give the purchaser a statement setting out briefly the particulars and prices

of the stock sold with the necessary cattle compensation stamps on it. This is necessary under the Cattle Compensation Act. The stamped statement must be given within seven days whether payment has been received or not. If payment has been received, the necessary information and cattle compensation stamps can be placed on the receipt. If the amount exceeds £2, a duty stamp must also be added.

Cattle compensation stamps to the value of 1d. for each pound or part thereof, with a maximum of 2s. 1d. for any one animal sold, must be attached to these statements, with the exception that, where a number of animals are sold in one line at the same price, the value of the stamps may be calculated at 1d. in the pound or part thereof on the total amount.

As the maximum amount of compensation that will be paid on any one animal is £25, it is only necessary to place cattle compensation stamps to the value of 2s. 1d. on the statement, even though the animal may sell at 30 or 50 guineas or more.

Similarly, under the Swine Act, swine compensation stamps must be purchased and placed on statements or receipts concerning all sales of pigs, but as the maximum amount of swine compensation paid on any one pig is £15, a maximum of 1s. 3d. worth of swine compensation stamps need only be used for every pig sold at or above this figure.

Persons who sell cattle and pigs without placing the compensation stamps on the statement of sale or receipt are liable to a fine, and persons who buy cattle or pigs without receiving a stamped statement or receipt will not receive compensation in the event of such stock contracting a disease which would entitle the owner to claim for compensation under the Acts.

PIGS

Pig breeders would be well advised to select their future breeding stock when they are at the bacon or pork weights at which their progeny will be judged by the meat trade. What a mature boar or sow looks like does not matter as much as what their progeny look like when ready for slaughter,

Mr. L. H. Castle's "Clarendon Superior 9th," champion Large White sow, and mother of winning bacon pigs at the Melbourne Royal Show, 1946.

and that is what pig judges must endeavour to estimate when making their awards in stud classes.

There are some breeders and exhibitors of stud pigs who believe that show schedules should be framed to place more value on classes for stud pigs of bacon and pork weights and sizes, but there are many difficulties in the way of putting that principle into practice.

At the Melbourne Royal Show, emphasis is placed on the classes for bacon and pork pigs by providing an attractive list of prizes. However, to most people there is still more glamour attached to the championship awards in the stud pig classes which usually go to mature pigs.

Full credit should go to the champion Large White sow in the 1946 Melbourne Royal Show because, in addition to taking that chief award herself, two of her progeny, which were of baconer size, won prizes in the stud classes, and her progeny also won the Bacon Pig Competition in which points were awarded for litter weight at eight weeks old, rate of growth to slaughter age, and carcass quality. This sow looked good in her stud class, but was proved good in the bacon pig class.

Another point of interest in the winning bacon pig entry was that their sire was a half brother to the champion Large White boar of the show.

[L. A. Downey, H.D.A., Pig Expert.]

POULTRY

Many fowls die from heat apoplexy during very hot weather. The best preventative measures are the provision of plenty of

ventilation in the houses and spraying the birds and litter with water. Drinking vessels, containing clean cool water should be placed in the most easily accessible positions, close to the birds, as usually when affected by heat they are so distressed that it is difficult for them to travel even a short distance.

The question is frequently raised whether the dry mash or wet mash system is the better for feeding for egg production. Each system has proved highly satisfactory in official egg-laying competitions and on commercial poultry farms. High egg-production appears to be more a matter of the laying capacity of the birds themselves. Some of the larger farms, however, feed wet mash when fresh meat, &c., can be purchased in a large way. There is no doubt that a good wet mash, well mixed, is very palatable, but there is no evidence to show that the birds will not consume sufficient dry food if the mixture is satisfactory. The palatability of a wet mash may be increased by varying the consistency from day to day. The dry mash system saves an enormous amount of labour, and it is a simple and clean method of feeding. Sometimes both systems have been used together to stimulate the appetite and increase the amount of food eaten.

Much money is spent unnecessarily by poultry farmers each year for so-called tonics, mineral mixtures, condition powders, "egg makers," and other similar preparations. Most of these preparations are of little or no value, and merely serve to increase the total cost of producing eggs. The best way to have healthy fowls is to feed them on a well-balanced diet, keep them free from lice and mites, and house them under clean, sanitary and comfortable conditions.

[H. F. Clinton, Poultry Expert.]

BEEKEEPING

In the Western District, Wimmera and Southern Mallee, an abundance of ground flora and the early blooming of the Yellow Gum have given bees a splendid start for the coming season. Most species of Mallee carry considerable bud and the Red Gum and Yellow Gum of the Western district promise a fair crop of nectar.

Swarm control is likely to occupy a great deal of the apiarist's time. The first essential to swarm control is abundance of good worker combs and manipulation of the colonies before swarming gets under way. Strong colonies, provided they are headed by young queens can be held in check if laying room is provided beneath the brood nest, as the queen will take advantage of the added space. With the fixed bottom-board, which is usual in migratory outfits, this may mean more work, as it entails double handling of individual combs. Better results will be obtained when adding the space below, as observation will show that the major portion of the fielders will occupy the extra comb room until the larvae make their appearance. Space below serves two wants in a populous colony; room for the fielders to camp off the brood area, and expansion for the queen. When queens are past their prime no manipulation can be used to advantage to allay swarming. Under this condition supersedure and swarming are correlated and will run their course. The re-queening of such colonies prior to the swarming season is the orthodox method to apply.

Some swarms will emerge in most apiaries, no matter what method is used. Spray pumps and plenty of water should be used on the swarms as the spraying settles them quickly.

If they abscond, when hived, from frames of brood and drawn combs, try a comb of stores next to the hive wall and a few sheets of foundation with drawn combs. Be sure that the hive was not resting in the hot sun before being put into use. Bees are loath to stay in a hive that is overheated. When hived place the bees in the shade.

The frequent extraction of honey generally allays swarming and any colonies persisting in queen cell building when stores are kept low probably desire to replace their queen.

The exchange of locations with weak colonies will break down the swarming propensity in strong colonies, as this manipulation robs the strong colony of its field force. Be sure the queens are vigorous in the weak colonies, as it is a waste of bees to boost up worn out queens. Cage the queens in the weak colonies. If any doubt exists as to their safety and if any fighting takes place, use plenty of smoke. It is advisable to give ample room for the added bees.

[W. A. Collins, Apiary Inspector.]

POULTRY FEEDING TRIALS *with* HERRING MEALS

By A. C. T. HEWITT, M.Agr.Sc., *Live Stock Science Officer and* W. O. PEDERICK

SAMPLES of 500 lb. of herring meal and 500 lb. of herring offal meal were obtained by the Food Control, Department of Commerce and Agriculture from Shafer-Haggart Ltd., Vancouver, Canada, during 1945 for poultry feeding. It was hoped, subsequently, if the feeding trials proved satisfactory, to import considerable quantities of this meal to alleviate the shortage of meat-meal in this country. However advice has since been received that no further supplies of the meal can be forwarded to Australia at present, owing to the acute shortage of protein-rich foodstuffs in Europe and elsewhere.

Several State Departments of Agriculture were invited by the Commonwealth Authorities to carry out feeding trials and were offered quantities of the herring meals. In July 1945, the Victorian Department of Agriculture made preparation to carry out two sets of trials, one at the State Research Farm, Werribee, and the second on the property of Mr. F. Batten, Bayswater-road, Croydon. In both sets of trials the herring meals proved to be palatable and satisfactory substitutes for meat-meal. Egg yields were high and no taints whatever were detected in the eggs.

Herring and Herring Offal Meals

The herring meal is a golden-brown colour with a fairly strong, wholesome fish odour. The herring offal meal is much darker in colour, with a stronger odour. Although several months in transit the meals arrived without showing any signs of deterioration or rancidity. They were shipped in light jute bags and paper bags, but the paper bags were not satisfactory as they did not stand up to the rough handling. The use of heavier jute bags (corn sacks) also would have been preferable to the light sacks.

The samples were chemically analysed and the results, together with the fat and protein contents given by the manufacturer are shown below :—

	Herring Meal.		Herring Offal Meal.	
	Sample.	Analysis from Canada.	Sample.	Analysis from Canada.
	%	%	%	%
Moisture ..	10·4	..	11·4	..
Ash	11·7	..	18·7	..
Protein (N x 6·25)	67·1	71	53·7	63
Fat (Ether Extract) ..	7·2	11	11·4	10·5
Crude Fibre ..	0·3	..	0·6	..

Trial—State Research Farm, Werribee

Two pens each of 50 second-year birds were made available for the testing of the herring and herring offal meals. The trials commenced on 23rd July and were discontinued 108 days later on 7th November, 1945. As the main points to investigate were the palatability and general effects on egg production and egg taints, no control pen was made available. The following are the details of the feeding in the two pens :—

Pen No. 1 comprised 50 White Leghorn hens which were fed free-choice herring meal and free choice herring offal meal from different hoppers, with whole-wheat fed in the litter twice daily. Greenstuff and shell grit were also available.

Pen No. 2 comprised 50 Australorp hens which were fed a wet mash comprising 15 per cent. herring offal meal and 85 per cent. ground wheat in the mornings with whole wheat in the litter in the

afternoons, greenstuff and shell grit. It was decided that if the eggs from this pen were tainted, meat-meal would replace herring offal meal until the taints disappeared after which herring meal would be used. However no taints occurred.

The following results were recorded :—

—	Pen No. 1. 50 White Leghorns.	Pen No. 2. 50 Australorps.
Feed consumed—		
Herring meal ..	203 lb.	..
Herring offal meal ..	135 ,,	97 lb.
Ground wheat ..	..	551 ,,
Whole wheat ..	1,064 ,,	571 ,,
Total ..	1,402 lb.	1,219 lb.
Number of eggs laid ..	3,170	2,711

In pen No. 1 herring and herring offal meal comprised over 24 per cent. of the total feed consumed, and in pen No. 2 just under 8 per cent. Although the protein content of these meals compares favourably with that of meat-meal, it is customary to feed only 5 to 7½ per cent. of the latter, 10 per cent. of a bran and pollard mash or 15 per cent. of a ground-grain mash. In similar trials where grain and meat meal have been fed free-choice, the birds ate about 20 per cent. of meat meal.

Samples of the eggs from both pens were tested for taints by officers of the Department of Agriculture, and by the Dietitian and a tasting panel at the Kraft Walker Cheese Co. Pty. Ltd. and no taints whatsoever could be detected. The Dietitian used the eggs for the manufacture of custards, scrambled eggs and a laboratory batch of mayonnaise, and it was not possible to detect any differences between the products made from these eggs and those made from eggs purchased on the open market.

Trial on property of Mr. F. Batten, Croydon

Mr. Batten made five pens each of 30 second-year White Leghorn hens and three roosters available for the trial and the feeding of herring and herring offal meal commenced on 21st July, 1945. The feeding in the different pens was as follows :—

Pen No. 1.—The rations consisted of a dry mash with wet mash at noon and whole wheat in the litter in the late afternoon. Both mashes contained 10 per cent. herring meal, 30 per cent. of bran, 30 per cent. pollard, 30 per cent. ground wheat.

Pen No. 2.—In this pen the mashes contained 10 per cent. herring offal meal, otherwise the feeding was the same as in Pen No. 1.

Pen No. 3.—The rations in this pen consisted of free-choice herring meal and free choice whole-meal with similar wet mash to that used in Pen No. 1 at noon.

Pen No. 4.—In this pen herring offal meal was used to replace herring meal. Otherwise the rations were the same as those used in Pen No. 3.

Pen No. 5.—In this pen laying pellets were fed in a hopper continually open to the hens and whole wheat was fed in the litter in the afternoon. (Pellets are a compressed poultry feed consisting of bran, pollard, meatmeal, etc.)

For the 30-day period from 18th August to 25th September, the number of eggs laid by the hens in the different pens was as follows :—

		Eggs.
Pen 1.	Dry and wet mashes with herring meal ..	554
Pen 2.	Dry and wet mashes with herring offal meal	491
Pen 3.	Free choice wheat and herring meal, wet mash with herring meal	469
Pen 4.	Free choice wheat and herring offal meal, wet mash with herring offal meal ..	556
Pen 5.	Laying pellets ..	543

Because of pressure of work, Mr. Batten was unable to keep records of egg production for a longer period.

Most of the eggs from these pens were incubated, and the number and quality of the chickens hatched were satisfactory to Mr. Batten, who is of opinion that the results from the pens receiving herring meals were better than from his other birds.

Acknowledgments

Thanks are extended to Mr. F. Batten and the Directors and staff of the Kraft Walker Cheese Co. Pty. Ltd. for their assistance and co-operation in the carrying out of these tests.

 (continued from page 494)

with the merinos, the dry ewes gave a slightly lower clean scoured yield. Considering the seasonal and nutritional conditions, the wool return from the merinos was quite good. Despite their age, five and six years, the fleece weights were better than those recorded in the previous year—which was not as dry as 1944, but during which, less hand-feeding was carried out. The values of the various groups of wool are given in Table 6 :—

TABLE 6.—WOOL VALUES—MANAGEMENT TRIAL, 1944.

—	Group 1.		Group 2.
	Wet.	Dry.	
	Pence per lb.	Pence per lb.	Pence per lb.
Merinos	12½	12½	13
Border Leicester x Merino.. ..	14¼	14¼	16

The valuers' remarks on the different types of wool are as follows :—

GROUP 1.—THREE SHEEP TO 4 ACRES.

WET EWES.

Merino.—Medium staple, thinly grown, light dust dry condition, part tender. Bulk quality 64s./70s.. Approx. clean yield 50 per cent.

Border Leicester x *Merino.*—Moderate staple, only fair bulk, thinly grown and part tender, light dust. Average quality 56s./58s. Approx. clean yield 58 per cent.

DRY EWES.

Merinos.—Short staple, thin and tender, some condition dusty. Quality 64s./70s. Approx. clean yield 48 per cent.

Border Leicester x *Merino.* — Moderate staple, only fair bulk, little thin and part tender, light dust. Average quality 58s. Approx. clean yield 58 per cent.

GROUP 2.—THREE SHEEP TO 8 ACRES.

WET EWES.

Merinos.—Medium staple, fair bulk, light dust, fairly heavy in condition. Bulk quality 64s.–70s. Approx. clean yield 48 per cent.

Border Leicester x *Merino.*—Good length staple, very fair, bulk dry condition, light dust. Bulk quality 58s. 60s. Approx. clean yield 62 per cent.

DRY EWES.

The small number of ewes was not sufficient to make a reliable sample.

A combination of the Tables 5 and 6 gives the following gross returns per head :—

TABLE 7.—WOOL RETURNS PER HEAD.

—	Group 1.		
	Wet.	Dry.	All Ewes.
	s. d.	s. d.	s. d.
Merinos—old	7 9	8 7	8 0
Merinos—Urisino ..	8 2	9 10	8 4
Border Leicester x Merino	7 10	8 1	8 0

—	Group 2.		
	Wet.	Dry.	All Ewes.
	s. d.	s. d.	s. d.
Merinos—old	8 3	9 10	8 8
Merinos—Urisino ..	8 11	10 6	9 0
Border Leicester x Merino	9 6	10 2	9 8

Fodder reserves at the Mallee Research Station.

Thus it will be seen that the returns per head were better in all groups in the lighter stocked section. The Border Leicester x Merino on the lighter stocking gave the best wool returns, while on the heavier stocking, their returns in this group were similar to those obtained from the merinos. The greatest gross wool return per acre was obtained from the heavily stocked area.

(f) Returns from Lambs

The incidence of lambing, lambing percentages and birth weights of the lambs have been discussed above. One of the objects of this trial was to compare the growth of lambs under different stocking and hand-feeding conditions. Owing to their irregular incidence, twins have not been included as such, but ewes which had twins have been credited with one lamb of average weight and grade.

In Group 1, there were 52 lambs; and in Group 2, 13 lambs which were not marketable as suckers and were retained as carryovers for fattening and disposal during the summer. For the purpose of estimating the total returns of the lambs, these lambs have been evaluated at the flat rate of 8s. 6d. per head. Those lambs which were in suitable condition were slaughtered "over the hooks" in the usual manner, the weights grades and prices being shown in Table 8 :—

TABLE 8.—GRADES, WEIGHTS AND VALUES (1944 SCHEDULE) OF LAMBS.

	Group 1.		Group 2.	
Number of lambs slaughtered	35		60	
Average frozen weight ..	25·7 lb.		28·6 lb.	
Percentage frozen weight/live weight	39·9		43·3	
Quality and Weight.	No.	Weight.	No.	Weight
		lb.		lb.
First 2's	1	33·0	11	32·1
First 8's	..	..	1	37·0
Second D's	9	26·6	14	26·4
Second 2's	4	30·0	28	31·5
Third L	20	24·0	2	25·0
Third O	1	30·0	4	31·2
	s. d.		*s. d.*	
Average value of carcass	13 8		16 3	
Average skin value ..	2 9		2 9	
Total value of lamb ..	16 5		19 0	
Percentage of first quality carcasses	% 2·9		% 20	

The higher returns per head, greater frozen weight, and better quality of the lambs in Group 2, resulted in double the revenue for fat lambs sold from that group, despite the fact that originally this group contained only half the number of ewes as Group 1. There were four times the number of lambs unfit for sale as fat lambs in Group 1 as compared with Group 2.

Ewes and lambs on area grazed by Group 2.

TABLE 9.—RECEIPTS AND EXPENDITURE—GROUPS 1 AND 2—1944.

Item.	Group 1.	£ s. d.	Group 2.	£ s. d.
Receipts.				
Lamb carcasses	36 at realization	24 12 8	63 at realization	51 0 0
Lamb skins	36 at 2s. 9d.	4 19 0	63 at 2s. 9d.	8 13 3
Carryover lambs	52 at 8s. 6d.	22 2 0	13 at 8s. 6d.	5 10 6
Wool value of ewes		64 5 9		44 16 10
Skin value of dead ewes		9 0 0		1 10 0
Total receipts		124 19 5		111 10 7
Expenditure.				
Rent of land		35 0 0		35 0 0
Freights and commission		7 0 6		7 7 3
Supplementary feed—Wheat @ 4s. per bus., chaff @ £6 per ton		134 14 0		37 10 0
Loss in value of ewes (see below)		28 16 6		1 17 0
Interest on value of sheep		7 8 0		3 14 0
Total expenditure		212 19 0		85 8 3
Difference between receipts and expenditure (excluding labour costs)—	Minus	87 19 7	Plus	26 2 4

(g) Discussion—Total Returns and Expenses

Table 9 gives a statement of the receipts and expenditure of the two flocks during the period under discussion :—

TABLE 10.—RELATIVE VALUE OF EWES BEFORE MATING AND AFTER WEANING.

—	November, 1943.	October, 1944.	
	All Ewes.	Group 1.	Group 2.
	s. d.	s. d.	s. d.
Merinos—sound mouths	12 6	10 0	10 6
Merinos—poor mouths	10 0	8 0	8 6
Merinos—Urisinos	17 6	15 0	15 6
Border Leicester x Merino	16 6	19 0	20 0

—	15th November, 1943.	6th April, 1944.	28th June, 1944.	13th October, 1944.
Group 1.				
Merino—sound mouths	42	41	38	38
Merino—poor mouths	55	50	44	44
Merino—Urisinos	25	25	24	24
Border Leicester x Merino	88	86	69	69
Total	210	202	175	175
Group 2.				
Merino—sound mouths	21	21	21	21
Merino—poor mouths	28	28	26	26
Merino—Urisinos	12	12	11	11
Border Leicester x Merino	44	44	43	43
Total	105	105	101	101

The loss in the value of the ewes is a combination of two factors. At the end of the experiment there were fewer ewes than at the beginning, and the values of the merino ewes had depreciated. More deaths occurred in Group 1. The number of ewes surviving at different stages of the experiment is summarized as follows :—

Valuations placed on the ewes at the beginning and the end of the experiment are set out in Table 10. The merinos had depreciated in value largely on account of their age, and on the whole they were not in as good condition as at the beginning. The crossbreds had shown an appreciation in value, as they were still young sheep,

and at the end of the dry period there was a demand for this type of ewe. At the commencement of the trial their condition was below that of the merinos.

Although the ewes mated in Group 2 returned a higher value per head, the total return per acre was greater in Group 1 by virtue of the larger gross value of the wool. The greatest difference in expenditure between the two groups was the cost of hand-feeding. This was greater in Group 1, because the paddock feed did not last as long as Group 2, and it was decided to feed chaff in order to provide some roughage with grain. Although the price of chaff normally rises during drought conditions, the price fixing regulations had the effect of keeping the price of home-grown chaff at the relatively low level which has been used in the preparation of Table 9.

The costs of labour have not been taken into account owing to the fact that much extra work was involved in the weighing, and recording necessary, under experimental conditions.

In October, the vegetative cover had been removed to a greater extent and the ground left in a condition much more susceptible to erosion in Group 1. This is a most important factor to be considered when comparing different rates of stocking and the maintenance of sheep by hand-feeding over long periods. Hand-feeding should be carried out, if possible, on heavier land which will not erode so easily.

SUMMARY

A trial was commenced at the Mallee Research Station, Walpeup, in 1943, with the object of gaining information on the supplementary feeding of lambing ewes during the autumn and winter.

A well-grassed area of 575 acres was divided into two equal sections, one of which was stocked with 210 ewes, i.e., at the rate of three sheep to 4 acres (Group 1); and the other with 105 ewes, i.e., at three sheep to 8 acres (Group 2). Because of the continued loss in weight of the ewes, in Group 1, hand-feeding with wheat was commenced on 2nd March with 2 oz. per head per day, which ration was gradually increased until 0·9 lb. per head per day was being fed on 24th April. In addition, 8–12 oz. of chaff per head per day was fed from 28th March. With Group 2, hand-feeding with wheat commenced on 19th March, being gradually increased until 0·9 lb. was fed on 28th April. No chaff was fed to this group.

The year proved very dry and there was little growth of grass, therefore hand-feeding was continued throughout the winter and spring until the lambs were despatched to market.

The serious mortality due to pregnancy toxaemia in Group 1 indicates that it is necessary to start supplementary feeding in time to prevent a serious loss in condition.

Rams were joined with the ewes on 15th November, 1943. The "peak" of the lambing in Group 1 occurred during the first few days of May, 1944, while Group 2 showed one "peak" at this time, and a higher one about 17th–20th May.

The lambing percentage in Group 1 was 56·7 per cent. and in Group 2 79·0 per cent. There was no material difference between the average birth weights of lambs from either group.

Although gross returns from wool were higher in Group 1, the value per pounds and per head was greater in the second group.

At the commencement of the trial, Group 2 contained only half the number of ewes that were in Group 1. However, the former group produced more than twice the value of marketable lambs—as the better growth of the lambs in this group enabled a larger number to be marketed. Lambs from this group were of greater frozen weight and better export conformation.

The net returns, without taking labour costs into consideration were in favour of Group 2.

The land on which the larger number of sheep were grazed was left in a condition much more susceptible to erosion.

It is not suggested that three sheep to 8 acres is the optimum rate of stocking for Mallee conditions. Owing to the varying amount of land under cultivation and the unreliability of the rainfall, it is difficult to assess carrying capacity. The information gained with Group 1 shows that hand-feeding with little paddock feed will not yield economic returns in such a severe drought, but Group 2 returns show that when some

roughage is still left in the paddock, supplementary feeding with wheat will give satisfactory results.

In assessing the economics of drought feeding, consideration must be given to the high cost or even virtual impossibility of obtaining replacement sheep after the drought.

On the results reported, relative financial returns will be determined by the price of wheat and of other fodders on the one hand, and the price of wool, fat lambs, and the surviving ewes on the other.

This report records the history of two identical flocks of ewes hand-fed under differential conditions in a severe drought and is of value as a guide to what might be expected under similar conditions in the future.

Reference

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* * *

Laminitis in Horses

Laminitis is an acute inflammation of the sensitive laminae of the hoof of the horse. These leaves are fleshy ridges which interlock with corresponding grooves on the horny portion of the hoof. Any inflammatory process in the hoof is extremely painful because of the unyielding nature of the wall and sole.

Horses with light limbs and heavy bodies or horses with flat spreading feet are very prone to laminitis. Working unfit horses in hot weather tends to precipitate an attack.

Other conditions which tend to bring on attacks are overfeeding on grains, particularly wheat, or greenfeed such as lucerne; overwork, especially when combined with exposure to cold and damp; or the absorption of toxic products from some other part of the body such as is seen in an attack of laminitis following womb infections in the mare.

The symptoms of laminitis are unmistakable. Laminitis occurs in one foot, two fore feet or two hind feet or in all four feet, but never in one fore and one hind. The horse adopts a crouching attitude and is reluctant to put weight on the affected limb. If the fore feet are affected they are "pointed" in front of the animal. If the hind feet are affected, all four feet are drawn under the body. A rise in temperature is seen and the hoof itself is hot to the touch. Tapping the hoof causes intense pain. In some cases of laminitis haemorrhages occur under the horn and sometimes blood escapes at the coronet. Such cases are usually fatal.

An acute attack of laminitis is usually followed by some change in the hoof such as dropping of the sole and lengthening of the toe. Such affected animals tend to move with a rocking foot action known as "going on the heels" and require special shoeing.

In the absence of veterinary help the farmer should adopt such methods of treatment as the administration of a quick-acting purgative, plus the application of cold packs to the affected hooves. Sometimes animals are placed on a wet swampy patch of ground with the same end in view. Hot wrung-out blankets applied to the chest and abdomen are sometimes used to divert the circulation from the limbs.

Recovering cases require graded exercise.

[R. D. IRVINE, B.V.Sc.,
Veterinary Officer.]

ORCHARD NOTES

Citrus Leaf Fall — Peach Rust and Brown Rot — Cherry Cracking — Tree Bandages for Codling Moth

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor.

Citrus Leaf Fall

LEAF fall has again been fairly serious in some of the Northern irrigated districts, the effect being most noticeable last month just before the spring flush of growth occurred.

Previous investigations have been carried out and there have been found to be several aggravating factors in this trouble. Some of these causes include frost damage, high winds, and dryness of the soil caused by low rainfall or poor penetration of irrigation water on heavy soils such as those occurring at Murrabit. Most citrus growers seem content to accept frost damage as one of the inevitable risks associated with this form of fruitgrowing, and apart from avoiding areas which are obviously frost pockets for planting citrus, very few attempts are made to protect trees from this trouble. Wind damage can be avoided by growing suitable trees for windbreaks as soon as citrus is planted.

The spray method of irrigation ensures an even distribution of water.

The main factor evident from previous investigations however, was the salt concentration in the soil on some groves where leaf fall was excessive. During a dry winter the salt which is dissolved in the soil moisture, becomes more concentrated as the soil moisture is reduced and, therefore, the uptake by the tree is increased. One reason for the rise of salt in the soil is the application of irrigation water over a soil which varies in texture from the top to the bottom of the run. Soils are usually lighter in texture at the top of the rise, and to adequately water the lower section it is very often necessary to overwater the section near the head ditch. This results in the development of a water table, which tends to bring the salt near the surface. This may result over a period of years in an increase of salt within the root zone of the tree. This difficulty may be overcome by arranging the irrigation system in such a way that each soil type may be watered separately. On light soils, the length of irrigation run should be limited to 3 or 4 chains.

Multifurrow or flood irrigation is preferable to using only two or three furrows. For best control of irrigation water, the spray system, already in operation in a number of groves, is definitely recommended.

Citrus growers would be well advised to use a soil auger to determine the extent of penetration of irrigation water and to make sure that trees are receiving sufficient moisture in the root zone. The use of the auger will also be of value in giving information as to whether the level of the water table is rising dangerously close to the surface. Where salt is present in the soil and the soil is of a light texture, underground drainage will result in the lowering of the water table, and also the removal of large quantities of salt by washing it through the soil. Heavy soil types are not responsive to drainage.

Briefly then, excessive leaf fall in citrus is an indication of some trouble, usually below ground, and this can, to a large extent, be overcome by correct irrigation methods.

Peach Rust and Brown Rot

Peach rust, which causes brown dusty spots on the leaves of peach trees and dark green depressions on the peach fruits, rendering them unsuitable for canning, may be controlled by a spray of dry mix lime sulphur during December if signs of the disease are noticed. Dry mix lime sulphur is made by mixing 16 lb. fine sulphur with 8 lb. finely ground slaked lime and 1 lb. of lime casein spreader in 100 gallons of water. The mixture should be kept thoroughly agitated in order to keep the components well dispersed. This mixture is also satisfactory for the control of brown rot on peaches, but it should not be used on apricots.

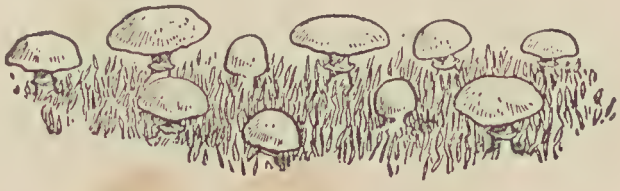
Cherry Cracking

Considerable loss sometimes occurs in cherry crops as a result of heavy rain just before the cherries are picked. This cracking of the fruit may be reduced by a spray of white oil emulsion, one gallon in eighty, just before harvest. Oil sprays cannot be used, however, if a spray of lime sulphur has been applied previously for the control of brown rot.

Tree Bandages for Codling Moth Control

Of all the methods subsidiary to spraying for codling moth, one of the most useful is that of attaching bands around the trunks of apple and pear trees to trap grubs leaving the fruit. This reduces the number of moths emerging from later broods. The corrugated cardboard chemical bands are suitable for smooth bark trees, but in some districts they suffer from the disadvantage that they are destroyed by birds in search of grubs. Bag bandages require more attention, as it is essential to remove them at least every ten days to destroy grubs. However, bag bandages usually trap more grubs than chemical bandages and they are more suitable for use on gnarled, rough-barked pear trees, where grubs can secrete themselves away from contact with the chemical in the corrugated cardboard bandages.

For the most efficient use of tree bandages, alternative cover such as loose bark should be removed, and cracks filled in so that the bands are the only suitable places in which the grubs can spin their cocoons. Bands should be attached to the tree trunks by the last week in November.



THE FLOWER GARDEN

By T. H. KNEEN, B.Agr.Sc., Principal
School of Horticulture
Burnley Gardens

Special Requirements for Summer Annuals

MANY of our commonly grown summer annuals require some special treatment if they are to give of their best. For most of them deep digging, thorough cultivation and liberal use of animal manures or composts are the main requirements. Sturdy, healthy seedlings planted out in well-prepared soil are not likely to fail, provided they are kept well watered during the growing period.

Summer annuals likely to benefit from an application of lime are Ageratum, Gypsophila, Lupin, Petunia, Zinnia, and Antirrhinum. A normal dressing of lime would be three to four ounces per square yard. To this list can be added the Delphinium, "Blue Butterfly."

Many annuals benefit from regular applications of liquid manure during the growing period, particularly after the flowering period has commenced. These include Phlox Drummondii, Sunflower, Tithonia (the Mexican Sunflower), Marigold, and China Asters. Phlox and asters both require protection when planted out. This can be afforded by using lawn clippings or light brush to shade the plants until they are well established. With asters, secure, if possible, wilt-resisting varieties such as Crego Giant or American Beauty. Asters suffering from wilt should be removed and burnt, as there is no cure for this disease.

Mulching is a desirable practice for many plants that are surface feeders and, in any case, it helps with weed control and provides additional plant food. When about two-thirds grown, mulch Petunias, Zinnias (the giant dahlia-flowered types) Cosmos and French and African Marigolds.

Provision should be made for staking some of the annuals. Light stakes are necessary for Scabious, Venidium, and sometimes for French and African Marigolds and Cosmos, if not protected from wind.

THE VEGETABLE GARDEN

Suggested Varieties for November Sowing

Vegetable.	Variety.	Occupy the Ground for Approximately—
Lettuce	Imperial 847	3 months
Beans—		
Dwarf French	Brown Beauty	3 months
Runner	White Monarch	Perennial
Tomato	Tatinter	7 months
	Orange Prolific (tall)	7 months
Cabbage	Drumhead	5 months
Cauliflower	Early Green Glazed	4 months
Pumpkin	Queensland Blue	5 months
	Triamble	5 months
Marrow	Green Bush	5 months
Cucumber	Long Green Prickly	5 months

The range of sowing which can be made in November is similar to that for October. A new-comer this month is cauliflower, and a suitable variety is Early Green Glazed. This variety however should not be sown until late November. One of the main considerations in growing cauliflowers and cabbages is to provide protection from attack by the cabbage moth and cabbage white butterfly. This necessitates regular spraying or dusting with arsenate of lead mixtures at intervals of ten to fourteen days. The seedlings will be attacked in the seed-bed and must also be protected.

The opportunity should be taken to prepare ground to receive sowings of carrot and parsnip in December. Choose ground which was heavily manured for a previous leaf crop, and concentrate on deep digging and cultivation to develop a fine tilth before sowing. The only fertilizer required will be superphosphate, which is best applied at the rate of 1 oz. to each six feet of row, along each side of the seed drill.

The attention of the reader is directed to the comprehensive series of articles now appearing in this *Journal* entitled "Vegetable Growing in the Home Garden" by Mr. George Hyam, Horticultural Supervisor. The October issue contained cultural information on the various classes of vegetable crops that may be successfully grown in Victoria.

* * *

Exchange of Information

A reader of the *Journal*, Mr. Allen L. Goodwin, "Milford," Mangalore, Tasmania, has written to the Department of Agriculture, expressing a desire to exchange views with Victorians interested in the following subjects:—Improved pastures, lucerne-growing, sheep-raising, poultry-farming, bee-keeping, mechanized and electrical farming, &c. Mr. Goodwin, who resides in a 20-inch rainfall district in Southern Tasmania, states that he conducts his own plant-breeding and experimental plots containing many varieties of lucerne, clovers and grasses.

MALLEE RESEARCH STATION

Experimental Work and Results

By OFFICERS OF THE STATION

The first and second instalments of this article dealing with experiments in wheat, oats, and barley, and containing information on crop rotation tests and cultivation trials, appeared in the September and October issues of this Journal.

SAND DRIFT CONTROL

The prevention or control of soil erosion is bound up with the correct use of land. Almost since the inception of the Station the matter of sand drift has received attention, and the investigations at Walpeup have contributed materially to our present knowledge of control methods.

The cultivation trials described above have supplied information both in regard to a comparison of wheat yields which can be expected after certain cultivation treatments and also to the liability of the land to drift when so prepared. The pasture investigations, rotations, grazing, stock feeding experiments and other trials and observations enable recommendations to be put forward which, if adopted, should greatly reduce sand drift

Control Measures On Cultivated Land

One or more of the following may be used :—

(*a*) The sowing on the fallow of a spring crop which, after light grazing, is sufficient to hold the soil from drifting and also to arrest the passage of sand through it.

(*b*) Leaving the fallow as rough as possible through the summer, which may be achieved by mould-board ploughing as the last spring operation, before which the area is either very heavily sheeped or lightly cultivated to prevent the growth, and particularly the seeding, of weeds.

(*c*) Avoid excessive cultivation of the fallow and particularly dry working.

(*d*) Where straw is present to an appreciable extent, the maintenance of it on the surface to hold mechanically the soil from drifting, such to be obtained by the use of the scarifier or disc implement instead of the plough.

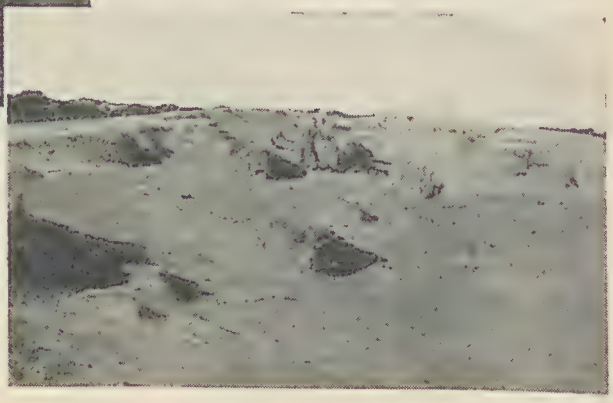
(*e*) The ridging (listering) of fallows either shallowly or deeply, is useful for a short time, but offers no real solution to the problem of sand drift. In some cases, however, this is the only treatment which can be applied on both cultivated and non-cultivated lands. If cloddy material can be raised

Left.—Fallow prepared by scarifying in July and ploughing later (Oct.) to leave rough surface. Drift was markedly reduced. Right.—Normal fallow showing large patches blown bare of mulch.

Left.—Even crop growing on fallow prepared by scarifying in July and ploughing later (Oct.) to leave rough surface and retain mulch. Right.—Showing patchy crop grown on normal fallow which drifted badly.

Left.—A sandhill stabilized with rye-corn.

Below.—The same hill prior to levelling and seeding with rye.



so much the better. On land where the surface mulch has blown away furrows serve to catch soil from adjoining areas and by so doing improve the condition of the soil for seeding.

(*f*) Adopt different cultivation treatment on "drifty" areas. Flats may be fallowed in the ordinary way, and the hills fallowed later, or cover-cropped.

(*g*) Grazing instead of ploughing. On very "drifty" areas fallowing could be eliminated altogether and the area sown with a cereal, preferably oats or ryecorn and grazed until the autumn, and then cultivated in readiness for the wheat crop. If overgrazed, such land will drift just as badly as does normal fallow.

Of the methods tested, that involving the use of a cover crop was the most effective in preventing the soil from drifting, and the drift on the areas so treated was negligible. In drought years, difficulty may be encountered in establishing a cover crop in the spring. This is the chief disadvantage of this method of control.

On one series of the cultivation trials, treatments on burnt and unburnt wheaten-stubble areas was introduced. Close observation and measurements of the amount of drift on the different plots confirmed the advantages of ploughing in the stubble as a drift control measure, instead of burning it. Also another series of plots has been started this year to further compare fallow on land where stubble has been burnt as against unburnt. The comparisons are to include liability to drift, disease incidence, effect on yield and the effect on the organic material of the soil.

Control Measures On Non-cultivated Land

The chief points for erosion control on land which is not under cultivation are as follows:—

(*a*) Avoid overstocking. As far as practicable grazing should be managed to ensure that sufficient cover is maintained on the soil to prevent erosion.

(*b*) If for any reason the land does not develop sufficient herbage to protect the soil, such land should be cultivated and sown with a cereal crop

(*c*) Early attention when bare patches begin to appear on sandhills or elsewhere in the paddock is desirable. These patches act

as focal points for the spread of erosion. Straw or stable manure on bare patches, or cultivation and sowing may prevent further damage.

Rye-corn has been found to be the most suitable cereal for growing on loose sand banks or hills depleted of surface soil and fertility by wind erosion.

The blowing of sandhills which have been denuded of vegetative cover by overgrazing or other means is a very serious form of erosion in the northern Mallee. If attention is not given to these hills, they soon become either "razorbacks" or "weeping ridges" which cannot be worked by ordinary implements. This type of erosion is commonly found on land that has not been worked for several years, and causes serious and constant trouble to public utilities such as roads, railways and stock and domestic water channels.

To demonstrate a method of stabilizing such hills, the Research Station, in co-operation with farmers in various parts of the Mallee, initiated a series of demonstration areas in 1945. The sites of these trials were at Danyo, Torrita, Ouyen, Lascelles, and Walpeup. Farmers who co-operated were Messrs. A. J. Wyatt, J. A. Pryse, J. A. Steele, and S. R. Pearse, while the work at Walpeup was done in co-operation with the Soil Conservation Board.

Showing difference in early growth of rye and oats. Left, rye; Right, oats.

The preliminary work on each site before sowing, consisted of ploughing up exposed hard patches or limestone areas where necessary, the levelling of the hilltops insofar as was practicable, and removing of stumps exposed by loss of topsoil. The whole area was then sown to rye-corn. A standard seeding rate of 45 lb. of rye-corn per acre was adopted, while a dressing of 50 lb. of superphosphate was used on the bulk of the area, but some strips were left without superphosphate. In all cases, the response to superphosphate on the demonstration areas was obvious, and was measured by sample harvesting. Other tests conducted at the Research Station indicate that a seeding rate of 45 lb. of rye-corn and 50 lb. of superphosphate per acre can be recommended for erosion control.

The demonstrations showed that it is possible to establish rye-corn on eroded soils where previously it was considered doubtful if vegetation could be supported, and also that the formation of sharp ridges can be halted by the establishment of cover on the sides of the ridges. The top will then blow and accumulate in the cover on the sides, thus reducing their height, and making it possible for the tops to be sown in another year.

Technical Studies on Drift

The physical condition of the surface soil is of considerable importance in determining the readiness

Rate of seeding trial with rye. Left, 15lb. per acre; Right, 60lb per acre.

with which a soil will drift and a number of factors, both chemical and mechanical, which affect the soil's physical condition have been studied.

In addition to determining the amount of drift which takes place when the land is subjected to various cultivation practices, and the efficacy of possible drift control measures, considerable attention is given to technical aspects of wind erosion. This involves studies of the relationship between atmospheric conditions and dust storms, amount and nature of eroding material, rate of erosion on normally cropped areas, and its effect on soil fertility. The value of shelter belts in reducing wind erosion has also been investigated.

The nature of the technical studies involves their continuance over a number of years to enable conclusions to be reached. Though not spectacular, they are concerned with the fundamental causes of wind erosion, and as such are an essential feature of the investigations.

Owing to shortage of staff during the war period, much of the soil erosion work was temporarily discontinued. It is hoped in the near future to give more attention to this problem. Offers by district farmers to co-operate with the staff of this Station by allowing inspections of their properties throughout the year and particularly during the fallowing period are appreciated. In this way, it is hoped that much useful information will be gained from inspections of the various fallowing modifications being used and tested under a wider range of conditions than is possible on the Mallee Research Station.

Boundary Control Methods

The control methods outlined above aim at preventing drift at its source. In order to protect essential services—roads, railways, or channels—boundary control methods are often used. The most common of these is to leave an uncultivated strip of land or easement on the windward side of the area to be protected. If such an area is grazed hard, the sand will blow across the smooth surface. Deep furrows on the easement will assist temporarily in trapping the sand, or crops may be sown to ensure that there is some growth to make the easement effective. Tests at this Station have shown that in some years, one chain of fairly thick growth is insufficient to trap all the sand from a paddock 30 chains wide, but that 3 chains was satisfactory for at least one year. However, the sand collected on the easement is a potential danger for the future. Brush fences are used in some places for protection, while the Victorian Railways Authorities have had success with wind-chutes to keep their lines clear of sand.

Boundary controls are temporary expedients only, and offer no real solution to the drift problem. Their efficacy for their special purpose depends on the quantity of sand they have to control. The most logical place to attempt sand drift control is on the areas where it originates.

PASTURE INVESTIGATIONS

One object of the pasture investigations at the Station is to demonstrate whether a better type of pasture can be grown in the Mallee than that which develops naturally on land left out of cultivation. In addition to increasing the stock-carrying capacity, an improved pasture would provide better protection for the soil against erosion by wind.

Large increases in carrying capacity are required to justify much expenditure on seed and manure for sown pastures in the Mallee. To be economically successful, a sown pasture in the Mallee must be cheaply established and produce superior or more feed than natural pasture over a number of years.

The cheapest forms of artificial pasture are probably sown cereals, or Wimmera rye-grass sown with the previous crop. Promising legumes are lucerne and barrel medick.

It appears, from the investigations already conducted, that, despite the labour involved in sowing, sown pastures in the Mallee cannot seriously challenge the use of cereal crops for winter and spring grazing, to supply adequate early green-feed for stock.

The value of sown pastures as compared with natural species lies in the greater

bulk of feed produced over a longer period of the year, particularly in the case of perennial types such as lucerne, which respond quickly to summer or autumn rain. The encouragement of clovers or medicks is also of importance in maintaining soil fertility. Certain natural species such as spear grass and barley grass, seed early and have objectionable seeds which may affect the wool and skins of sheep and lambs.

A feature introduced in 1934 was the establishment of a pasture plant nursery. In this, seeds of drought-resistant species obtained from various parts of the world were tested. Observations were made on their growth and persistence and those species which it was considered might be suitable for Mallee conditions were tested out in large plots under field conditions. Among those which have been tried out in the field are lucerne, crested wheat grass, perennial veldt grass, Wimmera rye-grass, blue lupins, early strains of subterranean clover (Dwalganup, Mulwala, and Bacchus Marsh), barrel medick, confinis clover, snail clover, evening primrose, rice-millet grass, bulbous blue grass, Toowoomba canary grass, Palestine strain of strawberry clover, berry salt bush, and sheep's burnet.

Specimen plants of Barrel "clover", growing at Walpeup.

In the field trials, the usual method of establishing the pasture has been to sow the pasture seed through a grass seeder attachment at the same time as the wheat is sown. Sowing is carried out on fallow applying a slightly lower rate of wheat seed per acre and a normal dressing of superphosphate.

With most of the species tested, the use of a cover crop did not materially affect their establishment. Very little, if any, grazing can be expected from sown pastures in their first year, and the use of a cover crop is a means of reducing the cost of establishment. In addition to providing some return from the land during this period, the crop affords the young pasture plants some protection from drifting sand during the early stages of growth, and the stubble left after harvest, protects the plants during the critical summer months.

Of the numerous species tested in the field those which show most promise under Mallee conditions are barrel medick, Wimmera rye-grass and lucerne.

Barrel Medick (*Medicago tribuloides*), which is also known as barrel clover, has shown particular promise and is the only one of the species sown in 1939 and 1940 that is still growing successfully in the field trials. Barrel clover should be of particular value in temporary pasture, for, being a legume, it assists in restoring soil fertility. Quite a number of local strains of barrel clover have been isolated, and these show considerable variation in type of growth, leafiness, and earliness.

To establish a balanced pasture, barrel clover and Wimmera rye-grass should be sown together. A suitable rate of seeding is 1 to 2 lb. of barrel clover and 2 to 4 lb. of Wimmera rye-grass. If no grass-seed attachment is available, the seed should be mixed with superphosphate, and sown at a shallower depth than normal. Such a pasture can be established on fallow with a cover crop of wheat.

Wimmera Rye-grass is a common species in many districts of Victoria, and in parts of the wheat belt it grows so

profusely after cultivation that it is regarded as a weed. It has established itself naturally in many parts of the Mallee. It provides a good bulk of spring feed, but does not provide as much early feed as barley grass which is a nuisance in late spring because of its seed head. Wimmera rye-grass is stimulated by light cultivation, and it thins out in a paddock lying out to grazing for several years. It has disappeared from the plots sown in 1939 and 1940, but still persists in the 1941 plots. It seems best as the component of a short term pasture, and gives best results in this respect when sown with barrel clover. When fallowing a Wimmera rye-grass area, it may be necessary to give an extra working, or extra sheeping, to make a satisfactory fallow. Several strains have been tested at Walpeup, and the early maturing strain, though less leafy, has given more feed than the later strains.

LUCERNE has proved a very satisfactory plant when a reasonable establishment has been obtained. To get this establishment, average rains in the year that it is sown, and a good summer rain appear to be necessary. At Walpeup, a better stand was obtained from the 1940 sowing —a dry winter, but with heavy January rains (358 points), than the 1941, when a better initial establishment was obtained, but was followed by a very heavy mortality during the dry summer. A particularly good stand was obtained from the 1939 sowing, and for the three following seasons, this lucerne area of 10 acres averaged a sheep per acre all the year for the three years. The stand persisted until 1944, but died out during the severe drought.

A seeding rate of 2 lb. per acre of lucerne with a cover crop on fallow, has proved the most satisfactory. The low rainfall conditions will not carry a heavy plant population, and if there are too many plants, they will be stunted and not sufficiently deep-rooted to withstand a dry period.

The factors which limit the wider use of lucerne in the Mallee are the uncertainty of its establishment, and the need to graze the stubble leniently so as not to overgraze it in its first season.

Other Pasture Species

Of the other species, probably the most promising has been perennial or South African veldt grass (*Ehrharta calycina*). It is a tussocky perennial palatable to stock, and spreads slowly by seed. The seed ripens unevenly, and commercial samples contain much inert matter. A strain recently obtained from South Australia—Unarlee strain—shows higher germinating ability. The rainfall at Walpeup is probably too low for the successful growth of this plant, at least 14 inches being required for satisfactory growth.

CRESTED WHEAT GRASS is also a perennial grass that has persisted fairly well. It is of more prostrate growth than perennial veldt grass and does not produce as much fodder as the veldt grass. As is the case with veldt grass it seems that the rainfall is too low for this plant to be an economic possibility in the Mallee. It has been used to a large extent in stabilizing wind eroded country in the Canadian prairies; but is unlikely to be successful for this purpose here.

BULBOUS BLUE GRASS has proved very drought resistant, but does not produce sufficient growth to warrant sowing it on a large scale.

SNAIL CLOVER makes considerable growth, but does not recover after a grazing. Another medic, *Medicago intertexta*, is now being tried; this plant makes vigorous growth and is being watched with interest.

EVENING PRIMROSE has not given encouraging results at Walpeup, although this species does well on some of the light sands in areas with a little better rainfall. A good stand has been noted at Ngallo, south of Murrayville, where its growth is confined to the light sands. Although sown on the flats, it has not successfully established itself there.

The early strains of subterranean clover grow quite well in the first and second year, but usually dry off in the second year before seed is set.

BLUE LUPINS have not made satisfactory growth at Walpeup. Inoculation of the seed with bacteria has not resulted in increased growth. It is thought that

the soils are too alkaline (limey) for the successful growth of this plant, which has proved of value in parts of Western Australia.

Satisfactory stands of BERRY SALTBUSH have been obtained from seed, but sheep do not eat this until the other plants in the area are eaten out.

TOOWOOMBA CANARY GRASS gave satisfactory germination on the area sown without cover crop, but practically no establishment where cover crop was sown. However, this plant has not given satisfactory growth under field conditions.

A variety of *perennial wheat* produced at Werribee (Ghurka wheat x Intermediate wheat grass), is at present undergoing preliminary trials as a grazing plant.

SMALL HAIRY BURR MEDIC (*Medicago minima*) occurs naturally, and is spreading in the district. It has shown a good response to superphosphate in small topdressed plots. This medic does not give the growth that barrel medic does, nor is it as palatable to sheep, and it has a very spiny burr that clings tenaciously to wool.

ARABIAN GRASS is a useful grass that has spread rapidly since its first appearance in the district about 1935. It does not supply a large bulk of feed, but it grows quickly after rain, and its seed head is not objectionable.

The search for an efficient, aggressive sandbinder is continuing, and a special plant nursery on a sandy site was established to test possible plants. Marram, kikuyu, and pyp grasses have not proved satisfactory for this purpose. A new introduction, Giant Star grass, is at present being tried.

The most satisfactory plant to stabilize drifting sand is cereal rye or rye-corn.

SHEEP INVESTIGATIONS

Breed Tests

In addition to their value as producers of wool, lamb, and mutton, sheep are invaluable in controlling weeds on cultivated land, i.e., as scavengers. There are normally about 1,500,000 sheep in the Mallee before lambing commences in the autumn, approximately 1,000,000 being breeding ewes. Of these, some 80 per cent. are mated to rams of British breeds, and the remainder to Merino, Corriedale, or Polwarth rams. Owing to the recent droughts, sheep numbers in the Mallee this year are less than half of normal.

Although a lamb of any cross may be fattened fit for slaughter, the better types are usually sired by rams of British

Shorn ewe weaners 6 months old. Corriedale x Merino (left), Dorset Horn x Merino (centre), and Border Leicester x Merino (right).

breeds, the most popular in the Mallee being the Border Leicester and Dorset Horn.

The following figures, based on statistics for 1946 show the order of popularity in the Mallee for the various breeds of rams in use:—

	Per Cent.
Border Leicester	53
Dorset Horn	21
Corriedale	11
Merino	7
English Leicester ..	2
Southdown	2
Romney Marsh	2
Other breeds	2

Some lambs in the Mallee as elsewhere are not sold as fats, but are disposed of as store lambs or carried over until the following year. The ewe weaners are potential mothers of future fat lambs, and are sought after by fat-lamb raisers, particularly in districts of heavier rainfall than the Mallee. The most popular fat lamb mothers are crosses between Merino ewes and long-wool rams, although comeback types are preferred by some farmers.

In 1939, an experiment was commenced with the following objectives:—

(*a*) To compare the suitability as mothers for lambs, both in the Mallee and in a "safe" district (Rutherglen) of crossbred ewes obtained by mating Merino ewes with various breeds of rams.

(*b*) To compare the various breeds of rams as sires for the production of fat lambs from Merino ewes.

In 1943, various feeding trials were commenced, and in 1945 the breed tests at Walpeup were widened to compare two breeds of rams as sires for the production of fat lambs from crossbred ewes.

Reports on these experiments are available in leaflet form, and will be posted free on application to the Manager, Mallee Research Station. The results of the investigations are summarized hereunder:—

The Production of Fat Lambs From Strong-Wooled Merino Ewes—Sire Trial

Strong-woolled merino ewes are considered suitable for Mallee conditions because of their hardiness and their wool-growing capacity. They are less prone to stray than crossbred sheep, and the halfbred ewe progeny from a merino ewe and a long-woolled ram is known to be a good carryover sheep if seasonal conditions do not allow it to be sold as a fat lamb.

In the trials commenced in 1939, a line of merino ewes was divided each year into three even flocks which were then mated separately to Border Leicester, Dorset Horn, and Corriedale rams. Mating was commenced in mid-November each year and the rams were separated from the ewes during the autumn, winter, and early spring. If the rams run continuously with the ewes, lambing is usually later.

The lambing percentages obtained were satisfactory and were approximately equal for each of the three breeds for the period under investigation. In some years, the Border Leicester cross lambs were dropped later than those sired by the other two breeds.

Details of the breeding and the date of birth of each lamb were kept, and regular weighings were made during the growth of the lamb. The wether lambs were disposed of as fats when at suitable weights and were appraised "over the hooks" at Western and Murray's Melbourne Works. The ewe lambs were retained, some being used at this Station and the remainder sent to the Rutherglen Experiment Farm for comparative testing there.

Early in the season the lambs sired by Border Leicester rams were lighter than those by Dorset Horn rams, but the Border Leicester cross lambs grew more rapidly later and were slightly heavier at the time of slaughter. The Dorset Horn cross produced 89 per cent. of first grade carcasses as against 81 per cent. from the Border Leicester cross and 72 per cent. from the Corriedale cross. There was no marked difference in the frozen weight to live-weight ratio between the Dorset Horn cross and the Border Leicester cross, but this ratio was lower in the Corriedale Cross.

Taking the experiment as a whole over the three years there is little difference in the return per wether lamb from the

Border Leicester or Dorset Horn ram when mated with the Merino ewe. Under the conditions of the experiment, which are typical of a large number of Mallee flocks, the quicker, earlier growth, and greater percentage of first-grade lambs sired by the Dorset Horn are made up for by the better late growth and extra weight of the Border Leicester half-bred lambs. The Corriedale cross lambs were inferior to the British breed crosses. It is emphasized that the experiment and results are for mating with Merino ewes only.

Lambs at Mallee Research Station, July 1946. At 14 weeks, these lambs averaged 38lb. frozen weight.

Comparison of Halfbred Ewes as Fat-Lamb Mothers

Some of the ewe lambs dropped in the above Sire Trial were retained and when 18 months old, along with a line of merino ewes of comparable age, were mated to Dorset Horn rams to give a comparison of the suitability of different breeds of ewes as mothers for fat lambs. Four lines, viz., Border Leicester x Merino, Dorset Horn x Merino, Corriedale x Merino and Merino were thus tested.

The incidence of lambing in this trial was concentrated and early for all breds (April–May). The Dorset Horn halfbred ewes were slightly more prolific than either of the other two crosses or merinos.

Lambs from the Border Leicester halfbred ewes had a greater birth-weight and generally gave a higher dressed-weight and a higher percentage of first-grade carcasses than the lambs from other groups.

Table 29 shows the average results obtained for 1942 and 1944 :—

TABLE 29.—COMPARISONS OF MERINO AND HALF-BRED LAMBS.

Lambs.	Dressed. Weight.	Percentage Live Weight to Dressed Weight.	Percentage First Grade.
	lb.	%	%
Dorset Horn x (Border Leicester x Merino)	40·2	46·6	96·7
Dorset Horn x (Dorset Horn x Merino) ..	38·1	46·0	95·8
Dorset Horn x (Corriedale x Merino) ..	35·7	45·0	84·5
Dorset Horn x Merino	33·6	44·4	77·0

Lambs from the Border Leicester halfbred ewes gave the greatest return per head, which more than counterbalanced the higher return for wool obtained from the Corriedale x Merino ewe.

Merino ewes when compared with halfbred ewes of similar age, produced lambs that made slower growth during the year, and were of less desirable conformation for export.

The value of the wool produced by the ewe is an important factor in determining the type of sheep to be kept. In the above trial, records were kept of the average weight per head and value of the wool from each of the crossbred types as lambs, as weaners, and as lambing ewes. It was found that the Corriedale x Merino halfbred ewe gave the greatest wool return in all stages.

Table 30 shows the gross financial returns per 100 ewes for wool and also for lambs of each of the crossbreds in the trial over a three-year period 1942–44.

It is seen that under the conditions of the trial the Border Leicester halfbred ewe has given the highest returns from lambs and the highest aggregate from lambs and wool. The Dorset Horn cross produced more valuable lambs than the Corriedale cross, but its wool return is the lowest of the three ewe types, resulting in the lowest aggregate. As set out in Table 33, this expression of the results assumes equal prolificacy from each type of ewe, and so probably under-estimates

the true return from the Border Leicester and Dorset Horn halfbreds, as compared with the return from the Corriedale cross or Comeback type ewe. With a comparative increase in the value of the Comeback type of wool, or a fall in lamb values, the Corriedale x Merino type would show to better advantage, but there are many possibilities in changes of price levels which would effect the comparative returns from the different crosses. The results tabulated in the free leaflet dealing in detail with the sheep investigations, enable the relative returns for any set of values to be calculated.

The wool returns per head from the merino ewes which reared a lamb were approximately the same as obtained from "wet" Border Leicester–Merino halfbreds, but were not as good as obtained from the Corriedale–Merino crossbred.

This investigation is continuing, but results to date indicate the superiority of the Border Leicester x Merino halfbred ewe over the other three types investigated, viz., Dorset Horn x Merino, Corriedale x Merino, and strong-woolled Merino as mothers for fat lambs under Mallee conditions.

A line of Border Leicester x Merino ewes is now being used in a trial to compare the fat lamb progeny of Dorset Horn and Border Leicester rams from this type of ewe.

Drought Feeding of Sheep

A trial was commenced during 1943–44 to study the effect of supplementary feeding of ewes and their lambs in the autumn and winter. The year proved to be a drought, and handfeeding was continued until the lambs were disposed of. 315 sheep were carried at two different stocking rates—3 sheep to 4 acres (heavy stocking), and 3 sheep to 8 acres (light stocking). Wheat alone was fed to those in the lighter stocking group, while the other group was fed chaff in addition to the wheat when paddock roughage was exhausted. Serious mortality due to pregnancy toxaemia in the heavier stocked group indicated that it is necessary to start supplementary feeding in time to prevent serious loss of condition.

Briefly, the information gained shows that handfeeding for lengthy periods when little paddock feed is available is not justified, unless cost of replacement of the ewes is considered, but that if some roughage is still left in the paddocks, supplementary feeding will give satisfactory results, and lambs marketable as fats can be produced by supplementary feeding with wheat under such conditions.

After a severe drought it may be virtually impossible to purchase sheep, and this factor must be given due consideration in assessing the economics of handfeeding.

In November, 1944, paddock feed was very short, and it was then obvious that handfeeding of some description would be necessary for at least 3 or 4 months.

It was therefore decided to handfeed 100 breeding ewes on wheat alone until there was sufficient paddock feed for them. These sheep were placed in a small bare paddock in mid-November, and kept there for eight months, by which time the green feed commenced to show after the June rains. For the

TABLE 30.—GROSS FINANCIAL RETURNS PER 100 EWES—THREE YEARS 1942–44.

Ewe Cross (from Yearlings to 3-year-old Ewes).	Wool from Dry Sheep.	Wool from Wet Sheep.	Total Wool Return.	Value of Lambs.	Gross Return.	
					Per 100 Ewes.	Per Head.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Border Leicester x Merino ..	14 16 10	33 5 8½	48 2 6	85 0 0	133 3 6	1 6 8
Corriedale x Merino	14 3 9	41 8 1	55 11 10	71 17 6	127 19 4	1 5 7
Dorset Horn x Merino ..	10 8 9	28 10 4	38 19 1	78 2 6	117 1 7	1 3 5

whole of this period, wheat was fed at the rate of nine-tenths of a pound per day. The ewes lost some weight, but they lambed satisfactorily, 81 lambs being dropped, of which 51 survived, finally being sold as trade lambs at the average price of 19s. 6d. each. Seventy-five of the original 100 ewes were shorn in September, cutting 6.8 lb. of wool per head, appraised at 7s. per fleece.

The actual cost of the wheat fed to the ewes was £65, which works out at the high rate of 17s. 4d. per head on the 75 which survived. High as this figure is, it is less than the value of the lambs and wool produced, and in addition there remained 75 ewes worth at least £100, compared with the 100 ewes, which if not fed, would have had to be sacrificed for approximately £50.

Dorset Horn cross lambs from half-bred ewes.

The reason for the more favourable financial result in this trial, as compared to the 1943–44 trial was that good spring growth enabled lambs to be fattened and sold on natural feed in 1945, while in 1944, handfeeding had to be continued until the lambs were disposed of or weaned. In the earlier year, the lambs were not fit for slaughter, and were only valued as stores.

During the period of handfeeding many enquiries were received concerning the advisability of crushing wheat instead of feeding it whole. Fifty dry sheep were divided by alternate drafting into two groups, and then run under similar conditions in a 20-acre paddock which was subdivided into two sections. The two groups were fed similar amounts of grain—one group whole grain (wheat), and the other crushed wheat, for three months. At the end of that time, there was less than half a pound difference in the average weight of the two groups. Thus no advantage due to the crushing could be demonstrated, and the cost of crushing (about 1s. per bag) is an additional factor that must be given consideration. Also, when wheat is crushed, it is essential that sufficient troughing is available for feeding the wheat in, whereas whole wheat can be fed on hard ground if troughs are not available.

From other trials during the drought, information was obtained regarding the suitability of various types of fodder for drought feeding, showing that carry-over lambs could be fattened on grains and disposed of in the following autumn, and that grain feeding during the drought yielded more satisfactory results if commenced before the ewes became too low in condition.

Border Leicester cross lambs from half-bred ewes. Both pictures were taken in July, 1946.

The 1943–44 trials showed that handfeeding under heavy stocking conditions left the soil in a condition very liable to wind erosion. It is suggested therefore, that before a paddock becomes too bare in a drought, sheep be excluded from it, and if there is no roughage on any paddock, that the sheep be kept in a relatively small area of heavier land,

[*concluded on page 539.*

CERTIFIED PULLORUM-TESTED FLOCKS (POULTRY)

A certified Pullorum Tested Flock is one in which all the breeding stock have given a negative reaction to the agglutination test for Pullorum Disease, and in which all such stock are kept under rigid conditions of isolation approved by the Chief Veterinary Inspector.

The undermentioned flocks have been certified by the Department of Agriculture, and will remain so until the next breeding season or until such time as the Chief Veterinary Inspector determines.

Full particulars of this scheme appeared in the February, 1942, issue of the Journal of Agriculture.

Application forms obtainable from the Chief Veterinary Inspector, Department of Agriculture, Melbourne, C.2.

Particulars of breeds of birds tested are as shown hereunder :—

A. Australorp; B. White Leghorn; C. Rhode Island Red; D. Sussex; E. Langshan; F. Brown Leghorn; G. Buff Orphington.

Owner.	Breed.	Number of Birds.
Abikhair, Leslie, 41 Wilfred-road, Ivanhoe	A, B	32
Adams, A. E., Toolleen, via Heathcote..	A, B	680
Andrew, C. S., Longlands-road, Mitcham	A, B, E	430
Ashgrove Stud Poultry Farm (Dr. S. Crawcour), Mountain-road, Cockatoo	A, B, D, E	3,012
Bantick, K., Old Dandenong-road, Heatherton	A, B	1,363
Barastoc Experimental Farm, Croydon P.O., (Manager, R. Canning)	A, B	988
Bartlett, N. M., Pimpinio	A, B	324
Bassett, R. A., South Muckleford ..	A, B	142
Batey, L. J., Katandra North ..	B	1,206
Batey, R. F., Invergordon South ..	A	1,412
Becker, F. W., Follett-road, Cheltenham	A, B	559
Beat, G. W., Mountain-road, Bayswater	A, B	358
Bingley, A. E., 333 Highbury-road, Burwood, E.13	B	791
Blackburne, J. W., Clarke-road, Cranbourne	A	172
Bode, C., Research	A, B, C	700
Bray, J., 18 Hotham-street, Warrnambool	A, B	72
Buchanan, R. O., Diamond Creek ..	B	2,384
Cakebread, H., Shady Creek, Buln Buln	B	251
Cannings, P. G., Shepparton East ..	B	2,587
Chapman, Mrs. E. E., Youanmite ..	A	316
Christie, R. R. & Son, Bentleigh ..	A, B, C	587
Clancy, J., Mount Taylor, via Bairnsdale	A	331
Clarke, F. W., "Barwondale," Stonehaven, via Geelong	A, B, C	100
Clements, W. H., 7 Crown-road, Ivanhoe, N.21	B, C	34
Cocks, W. C., Newton-street, Preston ..	A, C	548
Coleman, A. J., Mountain-highway, Bayswater	A, B	141
Colquhoun, Dr. W. L., "Aringa," Ringwood	A, B	194
Corbett Bros., Noel-avenue, Macleod ..	A	2,164
Cornish, J. T., Healesville	A	110
Coulson, Frank, Monbulk	B, C	226
Counsell, A. J., Koomba-road, Wantirna	A	503
Coupar, J. E., Box 18, Nathalia ..	—	813
Cracknell, D. M., Alma-road, Panton Hill	B, C	1,052
Cumming, H. D., "Jellalabad," Darlington	A	69
Curtis, J. A., Bulumwaal, via Bairnsdale	A	531
Davey, A. R., Stellavale Stud Poultry Farm, Sellars-street, Greensborough	A, B	1,237
Davidson, Mrs. A. C., 22 Sherbrooke-avenue, Ringwood	A, B	142
Davies, L. F., Ireland-road, off Westall-road, Springvale	B, C	2,056
Dawson, R. G., Maldon-road, Castlemaine	B	1,442
Dent, A. T., Sellars-street, Greensborough	A, B	1,592
Dookie Agricultural College, Dookie ..	A, B	897
Edwards, J., High-street, Wedderburn..	A, B, C	292
Ellett, Mrs. A., Island-road, Koo-wee-rup	A	152
Emery, Frank, East Doncaster ..	A, B, C,	598
Emmott, E. & T., Inglewood ..	A, B	283
Evans, J. W., Nathalia	B	1,142
Fellows, J., Yan Yean-road, Plenty ..	A, B, C	830
Fitchett, C. W., Tallo Ho	B	3,048
Ford, J. V., 11 Barker-avenue, Shepparton	B	535
Frye, I. H., Grimshaw-street, Watsonia	A, B	1,272
Gage, K. L., Clarke-road, Springvale ..	A, B	444
Gedye Bros., Railway-road, Blackburn..	A, B	4,799
Giarrusso, G., Lower Dandenong-road, Braeside	B	770
Gibbs, A. E., "Avonlea" Poultry Farm, Stanhope	B	2,761
Gibbs, J. L., Main-road, Lower Plenty..	A, B	40
Gibbs, Mrs. M. M., Yan Yean ..	C	71
Gilchrist, W. J., Rossiter-road, Koo-wee-rup	A, B	2,688
Gillespie, Mrs. L., Katamatite ..	A	128
Giovanetti, G. E., Skene-street, Kennington	A, B, C, D	385
Graham, C., Portarlington	A	88
Grayling, C. L., Marshall Free Bag, via Geelong	A, B	3,273
Grenville, G. W., Springvale South ..	A, B, C	3,087
Grosvenor, E. W. & E. K., Springvale South	A, B, C	574
Gwyther, R. P., Valley-road, Highton..	A, B	799
Hall, R. H., Wal Wal	A, B	884
Hall, W. S., Lyndhurst	A, B	955
Hamblin, N. A., "Sunny Hill" Poultry Farm, Toolleen	A, B	2,815
Hamilton, A., "Lyncroft," Flinders ..	B	788
Harding, T., Thomastown	A, B	3,518
Harrington, W. H., Golden Square ..	A, B	1,673
Harrison, Mrs. A. M., Cobden ..	A, B	93
Hayes, R., Mt. Dandenong-road, Montrose	A, B	739
Hedley, R., Rankin-road, Boronia ..	A	130
Hemphill, A. E., "Glenara" Poultry Farm, Monegetta	A, B	599
Henderson, C. W., Shepparton East ..	A	567
Henderson, W. R., 22 Chesterville-road, Cheltenham	A, B	110
Hewett, A. T., Central-avenue, Bayswater	A, B	1,349
Hill, A. E., "Tanglewood," Terrara-road, Vermont	A, C	218
Hockley, N., Main Eltham-road, Lower Plenty	A, B	183
Hollis, C., Donald	B	362
Hopkins, C. A., 13 Knight-street, Shepparton	A, B	1,037
Howard, A. P., Black Hill-road, Kyneton	A, B	1,299
Hunt, R. R., 365 Highbury-road, Burwood	A, B	1,094
Hurst, H., Eltham Hatchery, Eltham ..	B	1,583
Jenkins, A., Ridge-road, Kallista ..	A, C	524
Kemp, H. L., Whitehorse-road, Ringwood East	A, B	590
Kerr, J. J., Clarke-road, Springvale ..	B	1,422
Keyte, A. M., Private Bag 6, Natimuk	A, B	422
Kidgell L., L., Willowburn Poultry Farm, 34 Mullum-road, Ringwood	B	648
Kostos, D., Waverley-road, Oakleigh ..	A, B	1,839
Lang, John, 46 Dundas-street, Thornbury	E	74
Latta, H. J., Langwarrin	A	1,557
Lowe, G., "Blackwood Dell," Lillico ..	A, B, C	367
Lucas, G. & De Molnar, F. M., 4 Downing-street, Blackburn	B	1,923
McCabe, R., Gladstone-road, Dandenong	A, B	1,921
McDonald & Ellen, "Rossmoyne" Pig and Poultry Farm, Avoca	A, B	4,509
McDonald, R. A., "Barton," Moyston	A	122
KcKinnon, Miss M., Yielima	A, C	607
McTighe, C. H., Nar Nar Goon ..	A	444
McVay, A., Kernot-street, Spotswood (Ruskin Poultry Farm and Hatchery)	B	2,637
Mackintosh, W. C., "Clearview," Neerim South	A, B, C, D	974
Major, C. D., Simpson's-road, Eaglehawk	A, B	582
Mead, J. L., 28 Golf Links-avenue, Oakleigh	A, B	209
Meaklim, R., Mooroopna	A	110
Messenger, C., 240 Rathmine-street, Fairfield, N.20	A, B	160
Micell, M., Monbulk	B	402
Michell, R. J., Alkooma Poultry Farm, Macleod	A	1,095

Certified Pullorum-Tested Flocks *(continued)*.

Owner.	Breed.	Number of Birds.
Molson, W. E., Blackburn	B	886
Moore, H. A., Warrandyte-road, Ringwood North	A, B	897
Morgan, F. D., Willaura	A, B	298
Moroney, J. B., Kangaroo Flat	A, B, C	1,673
Muir, J., Quabba Poultry Farm, Ringwood	B	1,239
Mumford, L. J., Steele-street, Healesville	A	400
Myall, A. G., Main-road, Research	A, B	214
Nemet, P., Springvale-road, Springvale South	B	2,622
Nettelbeck, C. S., "Edenhope," Westell-road, Springvale	A, B	741
Niewand, F. J., "Kalang," Lubeck	A, B	906
O'Shea, J. M., Avoca	A, B	284
Overman, C. J., Vernal-avenue, Mitcham	B, E	1,623
Owen, H. T., Ashlyn Poultry Farm, Chum-road, Healesville	B	604
Paton, W. S., Blenburnie-road, Mitcham	A, B	528
Poulton, A. W., Vickers-street, Sebastopol	A, B	1,687
Power, M. J., 8 Danin-street, Pascoe Vale	A, B, C	858
Rae, J., 277 Albert-street, Sebastopol, Ballarat	B	1,965
Rees, H. F., "Wharepuke," Panton Hill	B	719
Reher, P., Holmeglen Poultry Farm, Burwood	A	2,125
Rerden & Stokes, Victorian Poultry Products Pty. Ltd., Central-avenue, Bayswater	A, B	1,934
Richards, J. F., 3 Spark-grove, East Preston	C	61
Riddell, M., Main-road, Doncaster East	B	866
Ridgway, G., Callander-road, Noble Park	A, B	464
Roberts, Miss A. E., "Range View," Launching Place	A, B, D	119
Robertson, D., 70 Somerville-road, Yarraville	B, C	56
Robinson, F. C., 6 Laurel-grove, Blackburn	A, B	187
Rodgers, C., Panton Hill	B	97
Rowe, D. and L., "The Wattles," Wal Wal	A	448
Salmond, J. B., Deer Park	F	245
Sanders, A., Stud-road, Wantirna	A, B	428
San Miguel, A. S., Woodhouse-grove, Box Hill	A, B	2,451
Sargeant, E. G., 261 O'Heas-street, Pascoe Vale	B, C	189
Scales, J., "Eellam," West Wattletree-road, Boronia	A	1,485
Scouller, R. C., Tarrant-street, Cobden	A, D	375
Simpson, G. D., Greenways Poultry Farm, May-road, Glen Waverley	B	4,867
Smith, E., Valley-road, Highton	B	1,505
Smith, H. A., Marong-road, Maiden Gully	B	1,391
Smith, K. M., Panton Hill	B, C	1,394
Smith, W. T., Panton Hill	A, B	1,759
Stant, F. E. and W. J., Springvale Chick Service, Springvale	A, B, C	4,218
State Research Farm, Werribee	A, B	1,176
Stewart, P. D., Bayswater-road, Croydon	A, B	733
Stiles Bros., Fair View Poultry Farm, Wallan	A, B	1,262
Stoneman, J. W., Carlella Poultry Farm, Campbell's-road, Briar Hill	C, F	151
Streeter, H. A., Avoca	B	508
Streeter, W., High-street, Avoca	B	648
Sutherland, J. M., Fulton-road, Box Hill	B	575
Sweeney Bros., Tarara Stud Poultry Farm, 55 Rundle-street, Ararat	A, B	929
Swift, D. A., Kangaroo Flat	A, B	2,226
Taylor, H. R., 119 Rathgowan-road, Reservoir, N.19	A, B	2,519
Taylor, R. H., 132 Rathgowan-road, Reservoir	A, B, C	2646
Turner, R. W., Donna Buang-road, Warburton	A, B	316
Walton, F. R., Woodvale-road, Boronia	A, B, C	403
Wanliss, W. J., Springvale-road, Springvale South	A, B	1,248
Watson, W. K., Greenvale-road, Somerton	B	201
Watters, N. J., 6 Alpine-grove, Pascoe Vale	A, B, C, E	139
Waugh, A. J., Kangaroo Flat	A, B	1,509
Webb, A. E. H., Frankston-road, Cranbourne	A, B	6,315
Welch, T. A., Bayswater-road, Bayswater	A, B	2,787
Wernli, J. H., Gheltenham	A, B, D	649
Wesley, J. H., "Fairview," Kangaroo Flat	B	2,226
Wheeler, F. R., c/o Mental Hospital, Ararat	A, B	90
Whitham, R. S., 28 Neville-street, Glenhuntly	A, B	132
Williams, V., 91 Tone-road, Wangaratta	A, B	726
Wimhurst, J. C., Private Bag, Tongala	B	474
Winter, G. S., Murgheboluc	A, C	714
Wohlers, S., Box 17, Jung	A	261
Wooster, G., Springvale	A, B	657
Wright, A., Wunghnu	B	923
Yates, W., 64 Bank-street East, Ascot Vale	A	35
Youl, R. S., Wycherley Stud Poultry Farm, "Wycherley," Wedderburn	A, B	1,674

MALLEE RESEARCH STATION *(continued from page 537)*

preferably protected by some timber. Sheep will then not waste energy walking over large areas and paddocks are not continually stirred up by the sheep wandering over them.

VISITORS AND INSPECTIONS

The Mallee Research Station is open to inspection at any time on week days, and visitors are welcome. Discussions on agricultural and pastoral matters between farmers and the staff of the Station assist the Department in planning its experimental work, and help the producer to appreciate the value of the investigations already carried out.

Farmers Field Days were interrupted during the war, but it is intended that they be again held regularly in the future. Arrangements for visitors to be conducted over the Station at other times may be made with the Manager (Phone Walpeup 2D).

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following herds have been declared free of tuberculosis under the *Accredited Tuberculosis-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86
Armstrong and Son	Wangaratta	105
Ballarat Orphanage	Ballarat	121
Banyule Stud Pty. Ltd.	Wangaratta	55
Beggs, A. R.	Beaufort	116
Black, I. S., Estate of	Mount Noorat	59
Bleakley Bros.	Horsham	16
Candler, G. E.	Hamilton	23
Carne, W. J.	Pakenham Upper	30
Clark, W. J.	Monomeith	148
Cowan, G. L. S.	Bacchus Marsh	59
Cribbes, T.	Wangaratta	39
Deering, J. T.	South Wangaratta	86
Dennis, Mrs. A. A.	Frankston	11
Dookie Agricultural College	Dookie	92
Everist, F. R.	Tyabb	12
Foletta, G. G., and Son	Buxton	121
Geelong Grammar School	Corio	78
Gleeson, P. J., and Son	Tynong	261
German, A. W.	"Cathcart," Alexandra	57
Griffin, G. W.	Gladysdale	50
Griffiths, J. G.	Benalla	151
Gross, Mrs. G. F.	Green Lake	23
Hamilton, A.	Flinders	67
Henry, J. A.	Warrnambool	45
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	70
Jakobi, L. W.	"Granada," Yannathan	89
Johnson, F. G.	Horsham	21
Judd, Mrs. D. R.	Broughton	16
Kingsley-Newell, F. J.	Shoreham	60
Lawrence, P. H.	"Rainga," Tarrawarra	83
Light, D. T.	Noradjuha	8
Longerenong Agricultural College	Dooen	39
Maloney, P. J.	Tongala	66
Maybery, A. H.	Horsham	16
Middleton, J. A.	Longwarry North	70
Murray, M. G.	Lima	26
McIntosh, J.	Merrigum	35
McKenzie, A. E.	Kerang	54
McNabb, G. A., and Son	Irrewillipe East	159
Nancarrow Bros.	Kerang	48
Nicholas, M. A.	Sherbrooke	78
Noonan, G.	Benalla	35
Noonan, Mrs. S. A.	Benalla	51
Northcote Children's Farm	Bacchus Marsh	48
Onley, W. H.	"Glenholme," Caldermeade	58
Parker, Mrs. L. M.	Tallarook	67
Payne, A. E. T.	"Yarra View," Lilydale	71
Payne, T. E. N.	"Woodburn," Kilmore	76
Poole, M. A., and D.	Caldermeade	125
Poole, M. A., and D.	Yannathan	104
Potter, W. J.	Longwarry North	130
Powell, T. S.	"Carellen," Mansfield	43
Reid, Mrs. B., Estate of	Bundoora	74
Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Roe, Thomas H. P.	Cobram	27
School of Horticulture	Burnley	6
Scott, F. E. Selwyn	Scotsburn	76
State Experiment Farm	Rutherglen	47
State Research Farm	Werribee	245
Stephens, Dr. F.	Vermont	40
St. Joseph's Home	Sebastopol	54
Vagg, T. R.	Officedale	40
Vagg, E. J.	Leongatha	48
Warnock, J. A.	Benalla	76
Waterhouse and Son	Pakenham	55
Wells, W. G.	Caldermeade	67

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.
Ballarat	119	2,757
Benalla	43	297
Bendigo	63	1,564
Broadmeadows	66	2,996
Doncaster	18	478
Geelong	132	4,235
Heidelberg	25	746
Horsham	7	382
Rutherglen	20	297
Traralgon	3	174
Wangaratta	45	438
Warrnambool	7	124
Whittlesea	119	5,432
Yallourn	4	370
Yarragon	35	1,656
Yea	30	82

There are also 304 herds in which 13,225 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.

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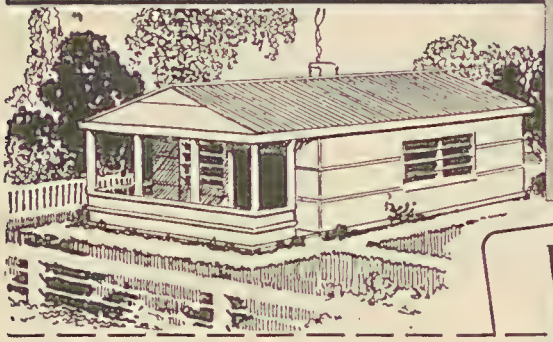

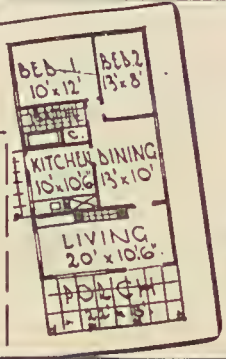

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FEEDING COWS FOR HIGHER MILK PRODUCTION

By A. C. T. HEWITT, M.Agr.Sc., Live Stock Science Officer

This farmer's stock won't be short of feed next winter.

THREE of the most important requirements for successful dairying, apart from men and machinery are a market for dairy produce, cows to produce it, and feed for the cows.

Seldom have these three requirements been favorable at the one time, and frequently both seasons and markets are poor. This year the markets are good, the season is assured, but there are insufficient cows due to drought and the failure of dairy farmers to rear sufficient heifer calves during the past few years. It is essential, therefore, that as much milk as possible shall be obtained from the cows that we still have and for this to be achieved, surplus feed must be conserved for feeding to the cows when the pastures begin to go off. By using this feed as good quality hay or silage, production of the cows can be maintained at a high level through the late summer, autumn, and winter.

The trend in dairy-farming has been towards maintaining the dairy herd solely on pastures and pasture products such as grass hay and silage, but unfortunately, the hay and silage fail far too frequently in both quantity and quality.

There should be no reason why the average production of our dairy cows cannot be raised from the present average of less than 4,750 lb. of milk and 200 lb. of butterfat to over 7,000 lb. of milk and 300 lb. of butterfat. Given reasonably good cows,

this could be achieved by looking after the pastures so that good grazing is spread over a much greater portion of the year, and by conserving more and better-quality hay to supplement the pasture when it cannot carry the milking herd in full production, or maintain the dry stock in first-class condition to enable them to produce their best when they freshen.

Pasture the Cheapest of Animal Foodstuffs

Pasturage is the cheapest of animal foodstuffs. Little equipment and labour are required to secure the growth of feed. It costs nothing to harvest as that is done by the grazing animals and no barns or buildings are required to store it.

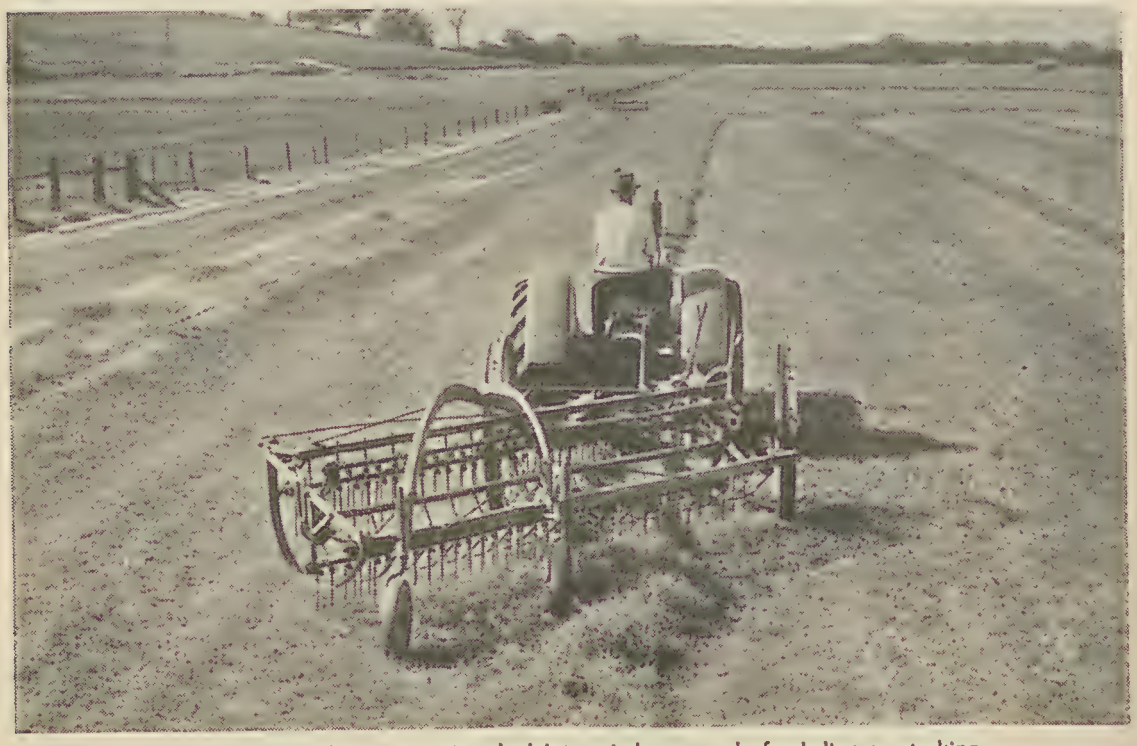
Although early grass contains a high percentage of water, it is rich in protein. This high protein content stimulates milk production and cows will milk well on it. It needs balancing with energy-producing foodstuffs, however, if high production is to continue and that is where hay comes in. Crushed oats are good too.

As the grass matures, it provides more feed and a better balanced feed, but a good cow working hard can gather only 150 lb. of pasturage on a good thick succulent sward 4 inches high, and this contains only enough nutrients to produce three gallons of milk per day. If the cow produces more, she rapidly loses condition. Hay again should be fed to top up the cow's stomach.

Oaten Hay and Chaff Valuable when Green Pasture is Plentiful

Oaten hay or oaten-hay chaff has many advantages over grass hay when there is an abundance of green succulent pasture. Oaten chaff contains some different ingredients—different nutrients—to grass or grass hay. These different nutrients help to balance the ration and lessen the incidence of bloat and milk fever.

Oaten chaff is also valuable in that it spreads harvesting over a longer period. It can be harvested after the grass hay is in. Grass must be cut early to make good hay—just as the anthers or pollen sacs are showing from the principal grass species, and while the clovers are in bloom. This grass must be dried and stacked or pressed before the green colour and nutrients are



Cut grass should be promptly raked into windrows ready for baling or stacking.

The pick-up baler greatly reduces the manpower required to press grass hay.

destroyed by bleaching in the sun or are leached out by rain.

Good green leafy pasture hay is palatable and rich in both vitamin A and protein. The real value of good quality hay rich in protein and colour is appreciated in the summer and autumn.

After the grass has matured, it lacks palatability and its protein content diminishes. Cows will not graze more than 30 to 40 lb. of grass a day after it has gone to seed. This is the time when hay will be appreciated, but it must be palatable, leafy, and a nice green colour and full of protein. Cows will top up on this sort of hay and continue to milk.

Silage helps at this time of the year too, and better yields will be obtained by feeding both hay and silage. Linseed meal and other protein-rich concentrates will supply protein and stimulate the appetite too, but they cost more than hay.

Good quality hay, sufficiently palatable to encourage cows off good pasture to eat it is what is wanted, not the kind of hay that only starving stock will eat.

Make Two Tons of Hay for Each Cow the Objective

Every farmer should strive to conserve two tons of hay for each milking cow each year. This quantity should ensure that some is available for the young stock. Bad seasons are doubly bad because there is insufficient pasturage for grazing and none for turning into hay. The farmer milking 35 cows and with 70 tons of hay in the shed when a bad season comes is indeed fortunate, but almost every farmer could be in as sound a position if he possessed sufficient foresight and energy.

Milk all the Year Round

By feeding hay, as briefly outlined, it should be possible to produce milk all the year round. Where cows calve all the year round, they should average not less than two gallons a day during the late autumn, and at least three gallons a day in the spring. If a large proportion of the cows freshen in January and February, and only a few in the late winter and spring, it should be possible to produce at least 2½ gallons a day all the year round. That

extra half gallon of milk a day in the winter means a great deal to the industry. An even level of production throughout the year is essential when supplying whole milk, and it would reduce manufacturing problems if the factories could obtain a more even supply than they do at present.

Where seasonal dairying is still carried out and all the cows calve between July and September, a four-gallon average should be obtained during October, November, and December from pasture and hay.

In regard to feeding, give each cow as much as she will eat without waste. Some of the hay should be chaffed and fed in the bails during milking throughout the year, and the remainder fed in troughs or racks or on the pasture. The better the hay the more the cows will eat and the more milk they will produce.

In 20 tons of good pasture, there are 6,272 lb. of digestible food units which cost approximately one-fifth of a penny per lb. In addition to its low cost, grazing provides clean healthy exercise, and clean living conditions for the cattle which lead to greater milk production. In the course of their grazing, cows can pick and choose their feed to some extent, but cannot do this when they are hand fed.

The food value of pasture and pasture products is shown in the following table:—

FOOD CONSTITUENTS IN 100 LB. OF THE UNDERMENTIONED FODDERS.

Fodder.	Dry Matter.	Starch Equivalent Energy.	Protein.
	lb.	lb.	lb.
Pasture, short, green and succulent	20	14	4·5
Pasture, mixed flowering	25	14	2·2
Meadow hay, good ..	85	48	8·0
Meadow hay, medium ..	85	37	4·5
Meadow hay, poor ..	85	22	2·9
Grass silage, good ..	20	12	2·0
Grass silage, poor ..	20	7	1·0

Standard Herd Records

The Standard Herd Records of pure-bred dairy cows which, in the past, have been published in the December, March, and June issues of the Journal, will, until further notice, be printed separately. Copies of the records may be obtained, free of charge, from the Superintendent of Dairying, Department of Agriculture, Melbourne, C.2.

Agricultural College Scholarships

Five Government Scholarships entitling holders to free tuition and board and lodging for three years at either Dookie or Longerenong Agricultural College, are available to boys attending State or Registered Schools in Victoria and who will be not less than fifteen years of age on 1st March next.

Two H. V. McKay Charitable Trust Scholarships each valued at £50 per annum and tenable for three years are also available under similar conditions in accordance with the terms of the Trust.

Intending applicants are reminded that applications for the abovementioned scholarships close on 21st December.

Application forms may be obtained from the Superintendent of Agricultural Education, 605 Flinders-street, Melbourne, C.3.

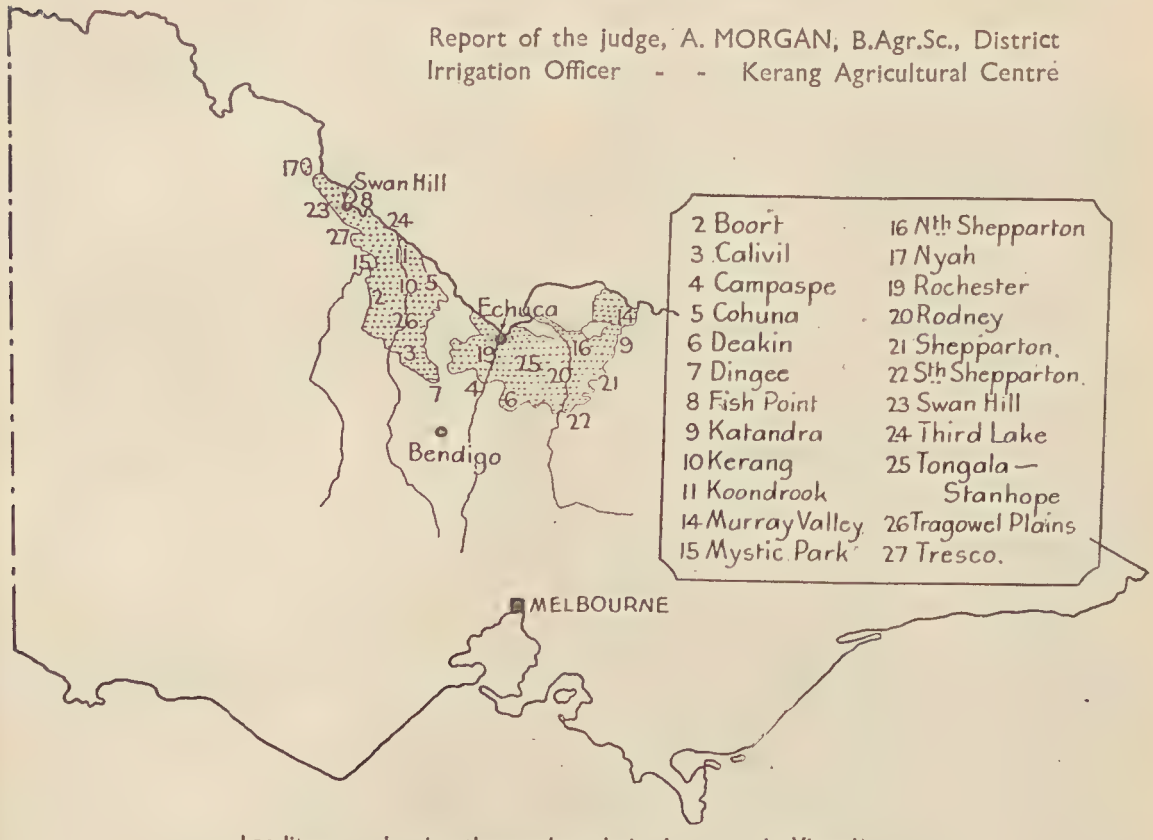
FODDER CONSERVATION

. . . IN THE . . .

NORTHERN IRRIGATION DISTRICTS

1945-46 COMPETITIONS

Report of the judge, A. MORGAN, B.Agr.Sc., District Irrigation Officer - - Kerang Agricultural Centre



Locality map showing the northern irrigation areas in Victoria.

AS a practical method of supporting and encouraging the conservation and storage of fodders throughout Victoria, the Royal Agricultural Society has subsidized district agricultural societies in regard to prize monies and expenses incurred in connection with the judging of fodder conservation competitions.

The following report deals with recent competitions conducted by district societies in the northern irrigation areas, and provides some interesting comparisons of irrigation conditions and practices in the various districts.

The districts represented were Kerang, Cohuna, Pyramid, Kyabram, and Rochester. Over the whole region, considerable differences in farming methods, due principally to variation in irrigation water rights assessments, are evident, and some comparisons between districts will be of interest to irrigators generally. Soil types vary even more, and there are some variations in rainfall and other climatic factors as shown in Table 1 overleaf.

TABLE 1.—METEOROLOGICAL DATA, VARIOUS NORTHERN CENTRES.

	Between 12″ and 15″ Isohyets.			Between 15″ and 20″ Isohyets (49 Years Average).	
	Cohuna.	Kerang.	Pyramid.	Kyabram.	Rochester.
Average annual rainfall, 1911 to 1935 ..	14·41	14·33	14·28	17·35	17·36
Average rainy days per year	57	67	53	69	*

From "Results of Rainfall Observations made in Victoria" 1937.

* Figures not available.

TABLE 2.—SOIL CLASSIFICATION.

Cohuna, Kerang, Pyramid.—

Grey and brown soils. Alkaline clay and clay-loams showing little or no downward leaching of clay. Calcium carbonate is present, frequently throughout the soil profile, and sometimes also gypsum and soluble salts. Includes also Mallee and Red-Brown Earth soil types.

Kyabram, Rochester.—

Red-Brown Earths, neutral or slightly acid sandy loams and loams overlying alkaline clay subsoils.

Some calcium carbonate is usually present in the subsoil, but gypsum and soluble salts are absent or low.

Grey-box woodland.

From Map No. 6, Report on Regional Boundaries, State Regional Boundaries Committee, 1944.

In the Kerang and Cohuna districts the presence of harmful concentrations of "salt" in the surface soil is of common occurrence. The irrigation water-supply position varies as between districts and within districts. In a general way, the use of irrigation water is more intensive, and permanent perennial pasture the more prominent crop in Cohuna, Kyabram, and Rochester as compared with Kerang and Pyramid. However, in spite of all the variables, the following analysis of farms entered in the Competitions, showing the acreage of improved pasture and/or lucerne, which is at present carrying the equivalent of one milking cow, indicates a fairly even ratio in all districts.

Table 3 suggests the influence of better rainfall and other conditions at Kyabram and Rochester, and also shows that out of 41 farms entered in the competition 26 were carrying one milking cow (or its equivalent) to between 1 and 2 acres of improved pasture and/or lucerne. In four out of the five districts, the carrying capacity of the bulk of the farms was on this basis. This suggests the influence of improved practices in smoothing out initial differences of soil, climate, &c.

TABLE 3.—CARRYING CAPACITY PER ACRE OF IMPROVED PASTURE AND/OR LUCERNE OF COMPETITION FARMS.

	Number of Farms Carrying One Cow (or its equivalent) to:—			
	0-1·0 acres.	1·1 to 2 acres.	2·1 to 3 acres.	3·1 to 4 acres.
Kerang ..	..	2	4	1
Pyramid ..	..	7	3	..
Cohuna ..	..	7	1	1
Kyabram ..	1	4	1	1
Rochester ..	2	6	..	..
Totals ..	3	26	9	3

TABLE 4.—RELATIVE DIVERSITY OF CROPS GROWN AND CONSERVED IN THE VARIOUS DISTRICTS.

Type of Hay.	Occurrence of Fodder Types at:—				
	Pyramid	Kerang.	Cohuna.	Rochester.	Kyabram
Lucerne ..	1	4	4	4	2
Pasture ..	6*	5*	4†	8†	6†
Cereal‡ ..	11	4	6	3	7
Summer fodders ..	4	..	..	..	..

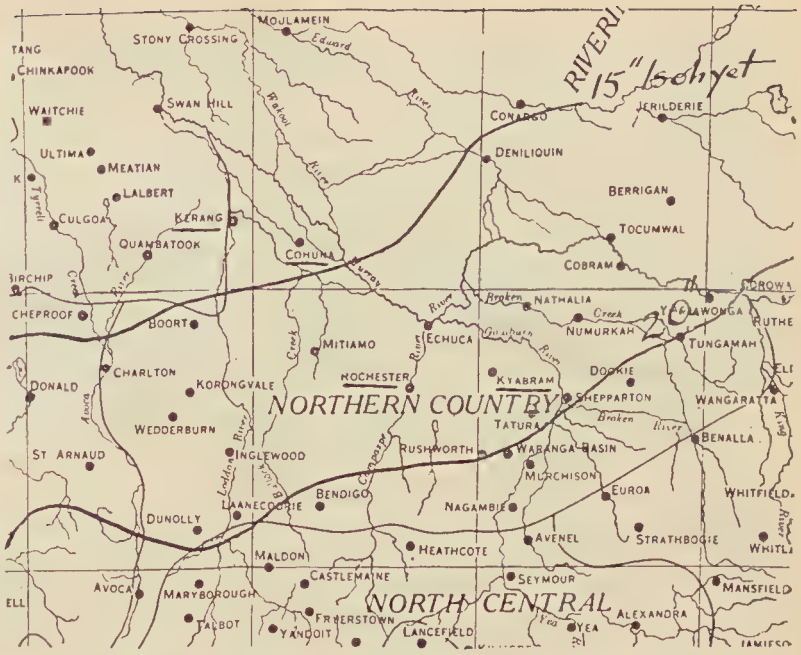
* Mainly sub. clover and Wimmera rye-grass. † Mainly Paspalum *dilatatum* and white clover. ‡ Mainly oaten.

From the above it is seen that the Pyramid district bases its fodder conservation largely on winter annuals (e.g., subterranean clover, cereals) while

the closer-settled areas rely more on the produce of summer-growing perennials (lucerne, mixed pastures).

QUALITY OF FODDER

The Rochester and Kyabram exhibits were distinctly more satisfactory in regard to quality of pasture hays, and the best of the lucerne in these districts was also outstanding in leafiness, colour, &c. However, success in curing is largely a matter of weather conditions, time of arrival of the baling contractor and other factors over which very little control can be kept. Illustrative of this, the best and the worst lucerne in the Rochester district was found in one stack, portion of which represented a cut spoiled by the January 1946 rain.

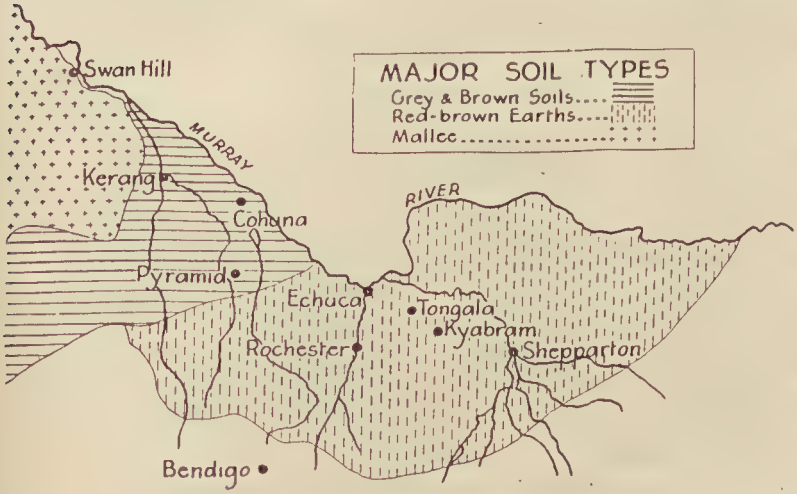


Map showing average annual rainfall, northern irrigation areas.

PROTECTION OF FODDER

The higher average annual rainfall of the Rochester and Kyabram districts was reflected in the greater attention paid to protection by :—

(*a*) Bag tarpaulins.
(*b*) Thatching.
(*c*) Shed storage.



Major soil types, northern irrigation districts.

With regard to baled hays, the methods of stacking were on the whole better in the Kerang–Cohuna and Pyramid districts. Judges of previous fodder competitions have commented adversely on the quality of baled hay, stating that owing to leaf losses and prevalence of mould, the baling was inferior to stacking of loose hay. This is largely a matter of weather conditions at the time of hay-making, and organization in regard to timing the arrival of the press. Baling appears to have contributed largely to the solution of labor difficulties, and given fair conditions there seems to be no reason why quality should suffer unduly. However, there is little virtue in conserving fodder if it is likely to suffer undue deterioration during storage, or is inconveniently stored in relation to the work of feeding out. In these connexions the present method of stacking baled hay can, in many cases, be considerably improved. Following is a list of defects noted :—

(*a*) *Deterioration of bottom layer.*—This is aggravated

by stacking the bales of this layer with the wires off the ground. More bales are thus liable to damage. The wires are seldom used again.

(*b*) *Stacks too large.*—Some calculation of the amount likely to be fed out can be made and one stack of suitable size put up.

(*c*) *Stacks too high.*—A stack of seven or eight tiers is the most satisfactory.

(*d*) *Stacks not roofed.*—A covering of loose hay sheds the rain better. This covering may require special attention if very windy weather is experienced.

(*e*) *Poor bonding.*—This causes leaning and other distortions of the stack, and possibly collapse of a corner.

In a report on the Cohuna Fodder Competition (Journal of the Department of Agriculture, August, 1942) a neat method employed by Mr. H. Stone is described. A chart, designed by the Australian Wheat Board showing the bonding employed when stacking bagged wheat, might well be used as a guide for stacking baled hay. The Wheat Board also recommends that wheat be stacked in sections to facilitate removal. This might also be applied to baled hay. The following diagrams show how these principles may be applied.

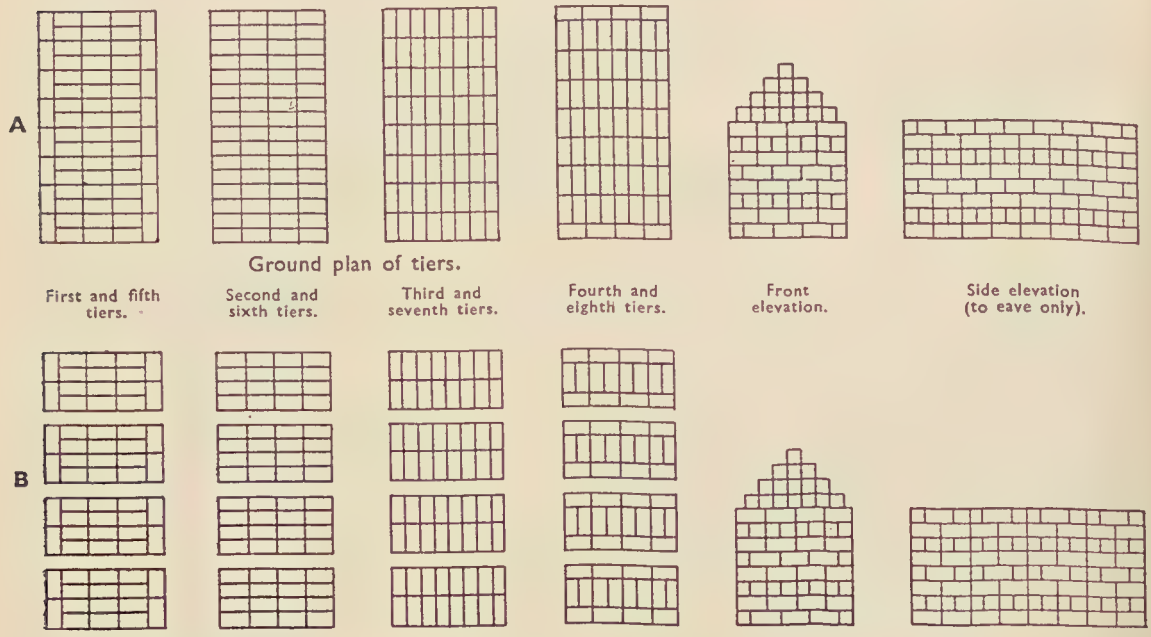
Loose hay on stacks of bales may be regarded as thatch, and in some instances exhibitors used "umbrella sedge" (*Cyperus* spp.) or "nut grass" as a covering. This latter practice has little to recommend it, considering that on properly laid out irrigation land this weed would not be able to develop in quantity.

According to some exhibitors in the Kyabram district, thatching of oaten hay stacks is not worth while because it encourages damage by mice.

Stack stands for cereal hay were seldom encountered, and few exhibitors used dunnage of any sort as a stack bottom. Mr. H. C. Wilson, manager at the State Research Farm, Werribee, who has had a long experience in stack building, makes the following comments ("Hay Making and Stack Building", Journal of Agriculture, November, 1935):—

"Provision should be made for a suitable stack base to prevent waste of the lower

Baled Hay Stacked on the Australian Wheat Board System



"A" equals single stack, comprising 640 bales.

"B" equals four small stacks, each 123 bales (to eaves), which can be butted together and topped with a total of 128 bales (grand total 640 bales).

layers of hay. A suitable stack bottom could be prepared by the use of stone, wood, or straw, whichever material is easiest to secure and of the lowest cost. A practice sometimes adopted is to cultivate the area marked for the stack base before settling the dunnage. This has been shown to prevent moisture lifting."

Sheds seen during the inspections varied little in type. A typical example was that of Mr. W. Collier's (Tongala) with dimensions 60 ft. × 24 ft., 14 ft. to wallplate. Most of these sheds were open at the ends, or closed only from ridge to wallplate at each end, with earth floors. The largest was that of Messrs. G. Starritt and Son, "Kelso Park", Mooroopna, which, if filled, would hold about 21,000 bales of hay. Grain was stored mainly in the bag, occasionally in a bin, tank, or silo. The largest silo was that of Messrs. Starritt, of concrete construction with diameter (internal) of 20 feet 3 inches and 24 feet in height.

Bails of this type were used for calf-feeding on the property of Mr. J. A. TILL, Koyuga South.

METHODS OF UTILIZATION

In the great majority of cases, particularly with baled fodder, the hay was carted out to the paddock and eaten off the ground. This was universal with dry stock—milking cows and calves were bail-fed by various methods. Mr. J. A. Till (Koyuga South) had a particularly neat arrangement for calf-feeding. Bails of similar type to those shown in the photograph were used, and were arranged in a line close to the hay shed. A concrete floor enabled maintenance of satisfactory sanitary conditions.

Where it is desired to distribute the seeds of white clover, &c., paddock feeding has advantages, also it obviates the travelling of stock along the farm lanes and reduces the mud problem.

For economical feeding, Mr. J. Shale's (Nanneella) system was outstanding. The chaffed pasture hay was blown into a loft over the milking shed, and hoppers of simple, but effective, construction ensured a continuous supply at the bails.

In those cases where cereal and pasture hay were conserved, the cereal hay was fed out to the dry stock and the pasture hay to the milkers.

PADDOCK FEED

Since fodder conservation is primarily designed to correct deficiency in quantity and quality of paddock feed in those periods when growth is restricted, those systems of farm management which result in a maximum of winter feed consistent with a high average-carrying capacity must be regarded as the most efficient. Grazed pasturage has been estimated to average one-fifth (or less) of the cost of any other fodder.

This fact is now being more fully appreciated by some dairy farmers in the Cohuna district, particularly those on small properties who have, in the past, concentrated on the production of pastures of perennial summer growths (such as white clover and Paspalum *dilatatum*). Paspalum is a poor species as far as continuity of feed is concerned. It is difficult to control in the summer, but yields nothing in the winter; this also applies to couch grass and to Rhodes grass.

To reduce the amount of fodder conservation necessary to winter feeding, some pasturage of winter-growing annual species is desirable, or alternatively, the white clover growth during winter must be fostered, either by more lenient stocking, or by increasing the rate of top-dressing with superphosphate, which stimulates winter growth to a marked degree. On some old paddocks

where the initial lay-out was faulty, a double purpose is served by ploughing up, regrading, and rebanking, and resowing with a mixture including perennial rye grass. There is no need to worry about the paspalum—it will return without encouragement.

Sowing oats on lucerne stands was a regular practice on one property in the Kyabram district. The recommendation of the Department is against the practice of "renovation" of lucerne by cultivation, following tests throughout the irrigation districts.

The practice of returning animal manure to each paddock in rotation will also have a beneficial effect. According to the "organic farming" enthusiasts such a course will obviate the necessity for top-dressing with superphosphate, but it is regrettable that these enthusiasts have temporarily mislaid their sense of proportion. Nothing can alter the fact that a quantity of phosphoric acid is removed annually from the farm in the milk and meat and must be replaced, more especially since practically all our irrigation soils were initially deficient in phosphoric acid in relation to the growth of the introduced plants on which the bulk of our livestock feed.

On the larger properties, subterranean clover is valuable in maintaining a high level of paddock feed during the winter.

KERANG DISTRICT

Messrs. Street and Hollingworth, Koondrook, who gained first place in the Kerang District Competition, operate a dairy farm of 320 acres with a water-right of 72 acre-feet and a sales quota of 9 acre-feet of water. Sown pastures consist of 60 acres of subterranean clover, 25 acres of old lucerne, and 15 acres of new lucerne. Self-sown oats occupied 15 acres, and 10 acres of oats were grown for hay last season.

Stock on the property included 4 draughts and 3 light horses, 28 milkers, 12 dry cows, 2 bulls, 20 young cattle, 20 young beef cattle and 3 breeding sows.

All fodder was baled, and included oaten and pasture hay, and straw, all of fair to good quality, totalling 4,100 bales (86½ tons).

The second prize went to Mr. H. L. Hollingworth, whose reserves also consisted entirely of baled hays stored in a fine galvanized-iron shed of dimensions 66 ft. × 40 ft. × 15 ft. The centre block of 21 ft. × 40ft. was concrete-floored, and one of the two skillions was used as an implement shed. Total area of the property is 281 acres, with a water-right of 67 acre-feet and a sales quota of 54 acre-feet of irrigation water.

Sown pastures provide the total reserves of 4,300 bales, harvested from selected paddocks in a total of 140 acres of subterranean clover and Wimmera rye grass, and 60 acres of permanent perennial pasture including lucerne.

The property is worked by tractors, and at the time of inspection there were 50 cows milking and six dry.

There is a small area of "salty" land on the property, the reclamation of which is slowed down owing to the fact that it has to be pumped on.

Until recently, Mr. Hollingworth also worked the property now occupied by Messrs. Street and Hollingworth. The fodder exhibited was all of good to prime quality.

COHUNA DISTRICT

Grass and lucerne hay, baled and stacked neatly in proximity to the farm buildings totalled 45 fodder units in Mr. H. Barr's winning exhibit in the Cohuna District Competition. There was an appreciable amount of mould damage due to insufficient protection following the opening up of the stack for feeding out. Situated in the intensive dairying area at McMillans, the total area of the farm is 74 acres, with a water-right of 1 in 1, and neatly subdivided to allow a good rotation of grazing.

Paddock-feed was scarce at the time of inspection as there are no winter pastures, the improved area of 67 acres consisting of 52 acres of summer pasture (white clover, &c.) and 15 acres of lucerne. In conformity with the high summer and low winter production of the pastures, most of the cows were dry during winter, only 12 being milked out of 45. Yearlings and other young dairy stock totalled 27, and 2 bulls were kept. Seven breeding sows and 2 boars were maintained for breeding. Out of a total of 67 tons of conserved fodder, about 21 tons was lucerne hay.

Second prize was awarded to Mr. C. A. Schier, Mead, who is engaged in mixed farming. The dairy herd of 50 milking cows,

An excellent mixed pasture under irrigation.

13 of which were dry at the time of inspection, is carried almost exclusively on 70 acres of intensively-farmed land, while 200 breeding ewes are run on an adjoining leased area of 300 acres of which 250 acres is irrigated. On the home block, there are 45 acres of permanent pasture, 10 acres of subterranean clover, and 10 acres of new-sown subterranean clover following an oaten hay crop. On the leased area, 60 acres of subterranean clover has been sown, and 20 acres of summer pasture. A good deal of this land is salt-affected.

In addition to the stock mentioned, Mr. Schier is carrying 5 draught and 4 light horses, 50 head of young dairy cattle, 4 bulls, and 50 young sheep. This competitor's fodder exhibit included a stack of oaten hay, four stacks of baled pasture hay totalling 2,420 bales, and some loose pasture hay; the pasture hay was of good quality and of high clover content. An eave on the stacks of bales had been formed with the idea of shedding rain a few inches away from the side of the stack. Total fodder units was calculated at 56.

Mr. T. R. Cleave had the greatest aggregate fodder conserved (82 units), but this was offset by the stock carried.

PYRAMID DISTRICT

Pyramid district had the honour of including a State championship winner—Mrs. A. Gronow—among its exhibitors. Mrs. Gronow carries on dairying, wheat-growing, fat-lamb raising, and summer-fodders seed production on her property of 1,038 acres. Total water usage averages 278 acre feet per annum as water-right, sales quota, and stock and domestic supply. Approximately 470 acres of the farm is not irrigated, and on this section 170 acres has been sown to wheat for grain.

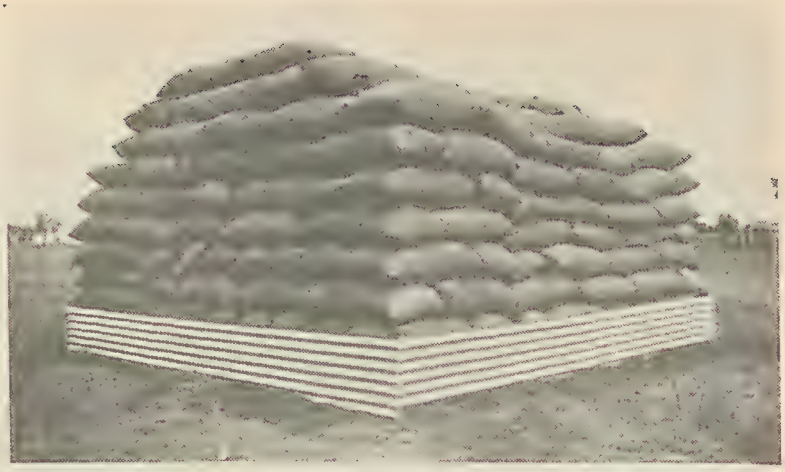
On the irrigable area, pastures consist of 50 acres of old subterranean clover, 30 acres new subterranean clover, and 35 acres of mixed pasture, while 80 acres of barley has been sown for grain and 90 acres of oats for hay.

At the time of the judging, 28 cows were milking and 2 dry. Other dairy cattle included 2 bulls, 28 young cattle, 6 draughts and 2 young horses. 98 breeding ewes were also carried.

The fodder was varied, comprising sheaved oaten hay, straw, grain, ambercane straw, and rye-grass straw. Except for grain stored in sheds, the stacks were located in a fenced yard near the milking shed, and fodder was carted out to the stock. No thatching was done, and no stands were provided for the stacks. However, all the fodder was of good quality, and there was good paddock feed as well as the 92½ fodder units stored.

Mr. A. W. Miles, Mitiamo, scored second place, with a total of 80 fodder units and 44 stock units on his 245-acre property, which was a very creditable performance considering that his total allotment of irrigation water averages 52 acre feet per annum. Fodder consisted of two stacks of

oaten hay and a storage of barley grain. The stock are carried on 85 acres of subterranean clover supplemented by feeding off part of the oaten hay area, which this year is 45 acres. One stack was protected by a bag cover. For feeding, the oaten hay is chaffed and bail-fed.



Grain reserves on the property of Mrs. A. Gronow, winner of the Pyramid District Competition,

ROCHESTER DISTRICT

The winner of the State championship in the "dairying under irrigation" section—Mr. J. Shale, Nanneella—was an exhibitor against seven others in Rochester district. This competitor's performance was the more outstanding considering that he has not been long established on the property, and that his total water allotment for the farm of 119 acres averages only 41 acre feet per annum. However, with the higher rainfall in the district as compared with Kerang, Cohuna, and Pyramid he is usually able to grow an area of cereal hay on rainfall, and has sown 19 acres for the next harvest. This supplements pasture and lucerne-hay cuts from 35 acres of lucerne and 44 acres of permanent pasture.

Fodder units comprising lucerne, barley, and pasture hay totalled 92 units, and the method of bail-feeding with chaffed pasture hay has already been described.

Total stock carried is 55 milking cows (17 milking at the time of judging), 1 bull, 9 young cattle, 2 draught horses. Good clover growth in the permanent pasture paddocks provided paddock feed.

Mr. D. Fehring, who has been a winner on previous occasions, secured second prize, with 63 fodder units (lucerne hay—loose—and pasture) as against 47½ stock units.

This exhibitor's property was outstanding in showing a carrying capacity of 3 cows to every 2 acres of improved land. Although the property totals 48 acres, 16 acres is not irrigable. The 32 acres of irrigable land is used for 7 acres of lucerne and 25 acres of mixed pasture, with an annual water usage of 49 acre feet. The January rain spoiled a good deal of Mr. Fehring's lucerne hay.

A flourishing rye grass and clover pasture on a Bamawm farm.

KYABRAM DISTRICT

"Kelso Park," Mooroopna, owned by Messrs. G. Starritt and Son, won the district competition. This

[*continued on page 584*

Aerial Spraying for the Control of Agricultural Pests in Victoria

By T. W. HOGAN, B.Agr.Sc., Senior Entomologist, Biological Branch, Department of Agriculture
and Flight-Lieut. H. W. SLAPE, No. 1 Aircraft Performance Unit, R.A.A.F.

TRIALS on the use of aerial spraying for the control of agricultural pests were commenced in Victoria, in December, 1945, when a serious outbreak of the Rutherglen Bug (*Nysius vinitor* Berg.) threatened the destruction of the stone-fruit crop in Northern Victoria.

It had previously been demonstrated by the Department that a D.D.T. emulsion, applied at a strength of 0·1 per cent. D.D.T. with orchard-spray pumps, would give complete protection of the fruit for a period of two to three weeks after each spray, but it was realised that considerable damage might occur before growers could spray all their orchards with the pumps at their disposal. The co-operation of the R.A.A.F. was therefore obtained in order to test out the possibility of spraying D.D.T. from aircraft in the manner used against mosquitoes by the R.A.A.F. in the Pacific.

In the past, crop-dusting from aircraft has been generally favoured rather than spraying, owing to the greater load needed for the latter. With the increased potency of new insecticides, such as D.D.T., and the application of the aerosol principle, spray materials can be used which are lighter, less bulky, and more manageable than the dust required for treatment of an equal area. Moreover, D.D.T. has given rather better results in the spray than in the dust form against most insects.

Drastic alterations were found to be necessary in order to convert the mosquito method to one suitable for agricultural-pest control. In this regard, the equipment and experimental techniques are still in course of development, but in view of the promising results being obtained, particularly against the Australian Plague Locust (*Chortoicetes terminifera* Walk.), an account of the work is being presented at this stage.

MOSQUITO CONTROL METHODS

The equipment and methods used by the R.A.A.F. for mosquito control in the war-areas can be briefly summarized as follows:—

Beaufort Mark IX aircraft were used, the spray solution being carried in a 138-gallon auxiliary bomb-bay tank and released through a single, vertical, streamline tube, 2 feet 6 inches long and 4 by 2½ inches cross-section, fitted to the bottom of the tank. The release was made by means of a pneumatic control, situated in the navigator's section of the aircraft, which, when operated, forced a poppet valve off its seat in the bomb-bay tank, thus permitting the solution to flow down the tube into the atmosphere. Atomization occurred due to the force of the airstream passing across the opening of the duct. The spray solution consisted of a 5-per cent. D.D.T. and 0.2 per cent. pyrethrins in a 50/50 mixture of fuel distillate and kerosene.

The rate of flow of the solution from the plane was one gallon per second, which gave a dosage of 2½ quarts per acre, and the spray solution was applied at this rate when the aircraft was flown at 150 m.p.h. and an altitude of 100 feet.

Fig. 1. Showing first modification to spray outlet from plane.

MODIFICATIONS TO THE AIRCRAFT FOR AGRICULTURAL PEST CONTROL

A Beaufort Mark IX has been used throughout the trials against agricultural pests. The aircraft has been modified to carry 520 gallons of spray solution. If the aircraft is required for flights exceeding two hours without refuelling, two 66-gallon fuel drop-tanks can be fitted to the wing bomb-racks. The maximum weight of the aircraft for straight flying and gentle turns is 21,500 lb.

Development of the Spray Bar

Following clear indications in the first test of incomplete atomization, a modification was made. This consisted of an atomizer-box containing 2,400 $\frac{1}{16}$-inch holes on the forward and side sections and welded to the lower end of the chute (Fig. 1). This gave better atomization than the original, but further improvement was still necessary in order to raise the air/solution volume ratio.

The next design was an attachment consisting of two horizontal steel streamlined bars 7 feet long, 6 inches apart, and with a single row of $\frac{1}{8}$-inch holes drilled at $\frac{1}{4}$-inch pitch on the top surface.

Satisfactory results were obtained with this design, but the output ($1\frac{1}{2}$ gals./sec.) was too low, and double runs were necessary to give the required dosage. To increase the output, the bars were lengthened and an extra one fitted.

Present Modification (Fig. 2)

Three streamlined bars, each 11 feet 10 inches long 4 inches wide and 1 foot apart, are now being used. These are attached to two vertical $4\frac{1}{2}$-inch diameter steel tubes which convey the solution from the bomb-bay tank to the spray bars. Baffles are fitted within these tubes to equalize the output of liquid from each spray bar.

The above apparatus gave excellent results against winged locusts, but poor results against the small hopper stage of the same insect, although laboratory tests showed no corresponding difference in their relative susceptibility.

To decrease the spray-particle size, $\frac{1}{16}$-inch holes were drilled on the lower side of the upper and lower bars and the smaller droplet size obtained in this way gave satisfactory results against the hopper stage. A flying speed of 200 m.p.h. has been found to give more even distribution of spray and smaller droplets than lower speeds.

This apparatus is now fitted to four planes which are operating against the Australian Plague Locust in North-Western Victoria (Fig. 3).

THE INSECTICIDAL SOLUTION

The inclusion of pyrethrins in the solution used against mosquitoes was apparently to

Fig. 2. Triple-spray bar used for dispersion of insecticidal solution against the Australian Plague Locust.

Fig. 3. Aerial spraying in operation against the Australian Plague Locust in north-western Victoria.

activate the insects, so that they would acquire a larger dose by flying. As there was no indication of activation of the Rutherglen Bug, pyrethrins were excluded from the second test. In addition, the concentration of para para D.D.T. was raised to 15 per cent. and to obtain this increase, mineral turpentine was included in place of kerosene in the proportion of two parts of mineral turpentine to one part of fuel distillate. Good results were obtained with this mixture but at a comparatively high dosage per acre (5 gals.).

Importance of Volatility of Carrier

In conjunction with the Chemical Warfare Section of the Munitions Supply Laboratories, laboratory equipment for the testing of the solution was developed at this stage. Essentially, this consists of a 20-ft tower, at the top of which is a chamber into which the spray is atomized, the insects being exposed at the bottom of the tower after release of the spray.

With this equipment, the importance of the volatility of the solvent-carrier became apparent, and it was found that any carrier of a volatility equivalent to or greater than kerosene was unsuitable owing to the wastage caused by evaporation. For this reason, water emulsions could not be considered for aerial spraying.

Unfortunately, most liquids of low volatility also have low solubility for the insecticides being tested, and in early tests the solubility was raised by addition of a small proportion of volatile solvent. In tests against the Australian Plague Locust, it was found more economic to use a larger volume of a lower strength involatile solution rather than to raise the concentration of the insecticide in the solution by the addition of relatively expensive solvents. This may not apply if solvents with very high solubility for benzene hexachloride (gammexane) were available locally.

Diesel fuel oil was finally chosen as the carrier having the optimum combination of qualities in respect to low volatility, cheapness, and solubility of the insecticide. Against locusts, a 4-per cent. wt./wt. concentration of gammexane, in diesel fuel oil has been found the most economical. With this solution a dosage equivalent to 1½ gallons per acre gave a 90 per cent. mortality under the test tower.

At the level of accuracy used in these tests, ortho-di-nitro-cresol, 92 per cent. para para D.D.T., and gammexane (13 per cent. gamma isomer) were found to be equally effective. As D.N.O.C. in oil solution causes damage to crops, and as D.D.T. is more costly than gammexane, the latter

Fig. 4. Placing smoke generators along the course the 'plane is to fly.

has been chosen for the large-scale work at present in progress. Later tests have shown D.D.T. to be less toxic than gamm-exane, but it may be the better insecticide where longer residual effect is necessary.

METHOD OF CONDUCTING FIELD TESTS

In Relation to Plane

The plane has been run at right angles to the wind direction in most tests, but effective control of the spray and slight concentration of dosage is possible by running obliquely with or against the wind. The course along which the plane is to make its run is indicated by two smoke generators (Fig. 4), the first at the point where spraying is to commence and the second where it is to terminate. Allowance for spray-drift is made by the ground operators. Over large open fields, flags can be used in place of smoke generators. The height the plane is to fly is related to the wind velocity as shown in Table 1:—

TABLE 1.—HEIGHT OF PLANE FOR AERIAL SPRAYING IN RELATION TO WIND.

Ground Wind Speed m.p.h.	Altitude in Feet.	Miles per Hour.
Calm	70	180
6–10	40–50	180
10–20	25–35	180

Instructions to the pilot are given by means of mobile ground wireless.

In Relation to the Spray

Estimation of the width of the swathe covered by the spray and variation in density of spray drops across the swathe is made by means of jump cards. These consist of sheets of typing paper pinned to boards and placed fifteen yards apart across the path of the plane.

In recent work, slides have been used so that particle size of the droplets could be estimated. For this work, the spray solution is dyed with William's Red, the slides coated with diglycol laurate, and counts of density and size of drops made through a microscope fitted with an eyepiece micrometer.

At first, all tests were made in the early morning to avoid upward convection currents, but with the use of a carrier of low volatility (diesel oil) this has been found unnecessary.

In Relation to the Insect Pest

In the orchard work, an "infestation rating" was made of treated areas before and after treatment. In some tests, tarpaulins were placed under certain trees to catch the insects which fell, for comparison with the numbers remaining on the tree.

Cages were used on several occasions and were useful in indicating the effective-swathe width, but they could not be taken as a true measure of mortality as the relation between the dosage in the open and that in the cage could not be ascertained.

In the experiments on grasshoppers, counts of live and dead along traverses over the treated areas were made 30 hours after treatment. The dosage per acre was calculated on the basis of the effective swathe-width only.

RESULTS OF FIELD TRIALS

Rutherglen Bug

The experiments commenced with a trial of the malaria-control method of dispersing D.D.T. with no change other than a range of dosages. The unsatisfactory results obtained by this method led to the modifications of both aircraft and solution previously described.

TABLE 2.—MORTALITY OF RUTHERGLEN BUGS AFTER EXPOSURE IN CAGES TO AERIAL SPRAYING WITH D.D.T. SOLUTION.

Cage Position.	Mortality After Treatment.	
	Six Hours.	Twelve Hours.
Row.	%	%
6	94	94
6½	94	97
7	13	74
7½	93	93

In the third trial against the Rutherglen bug using the double-spray bar and the 15 per cent. D.D.T. solution, a mortality of approximately 92 per cent. was obtained

with a dosage of five gallons per acre. An interesting effect which has been noted in later tests was the occurrence of a poor kill at one point in an area where, in general, high mortality occurred. This is shown by the figures of the mortality in consecutive cages placed in a section of the orchard (Table 2).

The reason for the occurrence of these areas of poor mortality is not known, but it seems likely that it may be caused by localized air movements.

Continuous rain for several days afterwards prevented any estimation of residual effect. This rain also caused the disappearance of the Rutherglen Bug outbreak and the work was transferred to the Australian Plague Locust which were then in unusually large numbers in Northern Victoria.

Spraying D.D.T. solution from aircraft against Rutherglen Bug in the Goulburn Valley area.

Australian Plague Locust

The first field test against locusts was against the winged stage, using the triple-spray bar and a five per cent. solution of crude benzene hexachloride (13 per cent. gamma isomer) in a solvent carrier of fuel distillate 74 per cent., benzol 20 per cent., and lubricating oil 6 per cent. Twenty-five acres were treated in all at the rate of 4 gals./acre, and a count on a double traverse across the field made 30 hours after treatment revealed a mortality of 98 per cent.

Laboratory tests showed 4 per cent. gammexane in straight diesel fuel oil to give equivalent results, but early tests against the young hopper stage failed to give a mortality greater than 90 per cent. This was attributed to spray particles formed by the plane being too large for use against the smaller insects. With smaller particles obtained with the present modification, 100 per cent. mortality was obtained over the greater part of the treated area with a dosage of 4 gallons per acre of the 4 per cent. solution, but occasional patches were noted in which a poor kill occurred, comparable with the effect observed in the Rutherglen bug tests. The full effect of the spray was not apparent till after 48 hours.

DROPLET SIZE

The theoretical minimum dosage with a particular spray solution would be achieved by means of a uniform distribution of the spray particles such that each insect received a volume of spray containing an amount of insecticide equivalent to the minimum lethal dose of the species concerned. The necessity for keeping down the spray load carried by the plane makes it desirable to use the smallest volume practicable, and with modern potent insecticides and high concentrations, very small volumes per acre can carry the necessary lethal dose, provided the spray is correctly distributed in the form of very fine particles.

Lower Limit to Droplet Size

A limitation to the smallness of the particles which can be used for aerial spraying is presented by the variation in their rate of fall. The smaller the particles, the slower the rate of fall, and therefore, the greater their drift from the point of ejection to lodgment. If treating large

tracts of the country-side, as in mosquito control, drifting of some of the particles for long distances is no great disadvantage, but for spraying crops, better control over placement of the spray is necessary, and a drift of more than 400 yards from plane path to the far side of the swathe is seldom allowable. An oil particle of 50μ diameter, released at a height of 40 feet in a 4 m.p.h. wind, would travel almost 400 yards, and therefore can be regarded as the lower limit for this type of work.

Upper Limit to Droplet Size

Limitation on the maximum size of the droplets in the spray is imposed by the desirability of using small volumes of liquid per acre and of making the most efficient use of the volume applied. Unless each insect receives an equal number of the droplets in the upper end of the droplet spectrum, there will be variations between dosage to individual insects, and, in consequence, either under, or over-dosage, of a proportion of them.

Once having decided upon a suitable volume per acre, the largest size of droplet which can be used without wastage will depend on the size of the insect being treated. The smaller the insect the finer the screen of particles which must be used to ensure an equal distribution of the spray to each insect and therefore the finer the sub-division of the spray volume that is necessary.

If one gallon of liquid is divided into droplets, 500μ in diameter, the average number of droplets available for each square centimetre of one acre would be 1·7, and as in field application, wastage would cause a further reduction in this number, 500μ appears to be too high for this volume per acre. At 250μ diameter, approximately 14 particles per square centimetre would be possible. Allowing for a proportion of them being sub-divided into smaller particles and for wastage, this maximum size would be practicable for large insects but would appear to be close to the upper limit. With small insects further sub-division would be necessary or else the rate of application of the spray increased. In the latter instance, a reduction in the concentration of the insecticide in the spray would obviate any increase in the actual amount of insecticide used, but would reduce the "pay load" of the aircraft.

Sources of Wastage

With present methods, these can be summarized as follows:—

1. Presence of a proportion of the particles above the optimum for the insect being treated.

2. As all known methods of atomization produce aerosols with a range of particle sizes, a proportion of particles so small that they will drift beyond the treated area will be present. This is not as an important source of wastage as (1) since a prodigious number of these particles can be formed with less wastage than comparatively few of excessive size, e.g., one droplet of 500μ will give 1,000 of 50μ or 1,000,000, of 5μ.

3. With the present apparatus, there is a tendency for the drops to be "graded" with the heaviest particles lodging on the side of the swathe nearest to the path of the aircraft and the lightest on the far side. In regard to this factor, it has been noted that droplets are not "graded" to the extent that would be expected from a knowledge of the differences on their rate of fall, a mixture of both large and small particles being present at all points. Air turbulence may account for this phenomenon.

Particle Size from Present Apparatus

The method of particle-size analysis being used needs further standardization, but present measurements indicate that the maximum-sized droplet is rather larger than desirable, being about 400μ on the side of the swathe nearest to the plane and about 300μ on the far side of an 88-yard swathe. No droplets have been recovered in this swathe below 50μ. The average number of droplets/cm.^{2} varies with conditions, height of flying, and the position in the swathe, but 50 drops per cm.^{2} is a typical number.

The best means of reducing the maximum-sized droplet from this apparatus is now being investigated.

SUMMARY

A series of aerial-spraying trials have been conducted against two agricultural pests, the Rutherglen Bug (*Nysius vinitor* Berg.) and the Australian Plague Locust (*Chortoicetes terminifera* Walk.). In initial tests against the Rutherglen bug, the malaria-control method of dispersing

[*continued on page 562.*]

LIVE STOCK NOTES

Compiled by
A. C. T. HEWITT, M.Agr.Sc.
Live Stock Science Officer

MATING FOR LARGE LITTERS

A correspondent recently asked the Department of Agriculture the best procedure in mating eight gilts which were coming in season within a few days of one another.

He was advised that one good service is sufficient for conception, but larger numbers of pigs per litter are usually obtained if the service takes place towards the end of the period that the sow is in season. However, as the length of the season varies from one to three days with different sows, it is suggested that matings should take place on the first day and again on the second and third days if they can be arranged.

In the case of several sows requiring service within a few days, it is advisable to allow only one service to each sow and two services daily for the boar, one in the morning and one in the evening. Then if, after all the sows in season have had one service, some are still in season they may be mated again.

Such controlled services are preferable to permitting the boar to run with all the sows together and serve at will, because under those conditions some of the sows may be neglected by the boar and he may become temporarily infertile by the time he serves some of the later sows.

Sows should be neither very thin nor very fat at the time they are mated, and to get large litters it is important to have them improving in condition. If, for any reason, it has been necessary to restrict the diet of sows to get condition off them, they should then have their diet increased to have them improving when mated and to keep them improving in condition during the first half of their gestation period.

The diet of breeding sows and boars should contain ample protein which is provided by many kinds of food, but particularly by separated milk, buttermilk, meatmeal and green food or lucerne or clover hay.

If breeding pigs are being fed mainly on cereals, they should be given about 1 oz. daily of a mixture of 4 parts ground limestone and 1 part salt in their food mixture or allowed free access to that mixture in a separate trough.

[L. A. DOWNEY, H.D.A., Pig Expert.]

CALVES REARED ON BREAD

Last year, Doreen, the twelve-year-old daughter of Mr. J. W. Shand, Cheltenham, reared eight heifer calves on stale bread and water in place of milk or milk substitutes. The calves have done remarkably well and are now about 12 months old. Six of these calves, which show Hereford and Shorthorn characteristics, are well-grown and in prime condition. The other two heifers are cross-bred Jerseys and also have done well.

The calves were given less than three gallons of milk each during the first few

These calves were reared on a bread and pasture diet.

days after birth, while being taught to drink and before being put on the bread diet. After that, the only milk that the calves received was in the rinse water in which the bread was soaked before feeding. Each calf was given a half loaf (2 lb.) of stale bread at each meal mornings and evenings and no other feed.

The calves were late, and did not receive the benefit of good green pastures until the autumn. At present the heifers are on excellent pasture.

Doreen, who attends the Brighton Technical School, looked after the heifer calves and, collected the stale bread from the bakery before and after school.

The splendid growth and development of these calves is evidence that it is not so much the kind of feed which calves receive as the care and individual attention given to them during the early stages.

Although bread may not be regarded as an ideal food, it is very digestible and, in this respect, it would be suitable for young calves, and far superior to many of the meals with high fibre contents which are sold for calf feeding.

(A.C.T.H.)

VIRGIN HEIFER PRODUCES MILK

Milk secretion in young unmated heifers and heifer calves occurs occasionally. Recently a twelve-months-old brindle grade Jersey heifer owned by Mr. T. W. Irvine, Yarra Glen, was noticed being suckled by her herd mate, a heifer of the same age. The suckling continued and, when fifteen months old, the brindle heifer had developed a well-shaped, capacious udder and was producing over one gallon of milk daily. The brindle heifer was well-grown and in good condition. She had been in season regularly, but had not been mated.

A sample of milk drawn from the brindle heifer was found to be normal, but as the sample contained all first-drawn milk and no strippings, the butterfat content was low.

The secretion of milk by maiden ewes and wethers is common in flocks of sheep troubled with the new functional disease, which has been reported from Western Australia, where the sheep are grazed on certain subterranean clover-dominant pastures. The secretion of milk can be induced by the presence of a female sex hormone, oestrogen. The feed or some other physiological factor upsets the balance of the hormones and probably causes abnormalities such as the production of milk by the abovementioned heifer.

(A.C.T.H.)

NEW HERD SIRE FOR BURNLEY

The Department of Agriculture has purchased the yearling Jersey bull "Coodardy Volunteer 2nd" from Messrs. P. W. Clark and Son, "Coodardy," Whittlesea, for the small Jersey stud maintained at the School of Primary Agriculture and Horticulture, Burnley Gardens, Burnley.

Udder development of the virgin heifer mentioned on this page.

Particulars of the new herd sire are as follow:—

Coodardy Volunteer 2nd Born: 13th September, 1945. Broken colour	Brucevale Lord Rupert (15446) Ten 2-year-old daughters Averaged 344 lb. butterfat	Mornmoot Melville (13977)	
		Brucevale Lady Masterpiece (39111)	
	Mornmoot Clementine 9th (63196) Produced 9,396 lb. milk, 505 lb. butterfat as senior 3-year-old	Werribee Warrior (12337)	
		Mornmoot Clementine 3rd (54243) Produced 8,870 lb. milk, 487 lb. butterfat as a senior 3-year-old	

The bull is descended from "Werribee" stock and his sire "Brucevale Lord Rupert" has ten tested daughters, which have produced an average of 344 lb. of butterfat in 273 days as two-year-old heifers in the "Coodardy" stud. The bull should produce very good stock at Burnley, where the cows are mostly by bulls bred in the "Selsey" stud.

[A.C.T.H.]

MYCOTIC DERMATITIS IN SHEEP

Mycotic dermatitis manifests itself as an inflammation of the skin with accompanying excessive yolk secretion, which mats the wool fibres together to form hard coagulated masses. In severe cases, the skin itself may become badly ulcerated with large areas becoming denuded of wool, or where the yolk hardens, horny-like growths appear.

The disease is infectious, and will spread through a flock if the conditions favorable to its spread, namely, warmth and moisture, are present. Affected sheep shear badly due to the hard coagulated masses.

Treatment consists of dipping affected sheep in a solution of 1 lb. of bluestone to 50 gallons of water, or where it is considered that the bluestone affects the wool, zinc sulphate used at the same concentration may be substituted. These solutions must not be combined with any of the usual arsenical preparations used against sheep ked (tick) and lice. Separate dippings are necessary for mycotic dermatitis and tick.

Badly affected sheep should be retained in isolation and given a second or even third dipping if necessary at intervals of a month before returning to the flock.

[G. Nicol, B.V.Sc., Veterinary Officer.]

POULTRY NOTES

Poultry owners should exercise caution when purchasing recently introduced appliances as many may be almost worthless or need further improvement to make them satisfactory.

This is particularly so with incubators. There are several good and well-known makes of electric incubators, and where electricity is available are recommended, as they are simple to operate and occupy a minimum of floor space. Incubators should be well constructed of good material.

Food-hoppers are often specially constructed of wood, or galvanized-iron by the farmer at the time the poultry pens are being built, but some good types are on the market. One large hopper is usually placed between two pens to supply food to the two lots of birds. They should be large enough to hold sufficient food to last for a week at least, and should be constructed so that a minimum amount of food will be wasted by the birds when feeding.

The best drinking trough is one with a good valve, which automatically supplies the water as required for separate pens of birds. The water containers must be cleaned out regularly, however, as there is no more rapid way of transmitting disease from pen to pen than through the drinking water.

There are many systems of brooding used for chicks. Those in which the chickens are allowed out on open grass runs and receive the benefit of direct sunshine, undoubtedly produce the strongest chickens. Chickens reared in this way are not likely to develop toe-pecking or feather pulling.

[H. F. Clinton, Poultry Expert.]

HONEY AND THE HOME MARKET

With the swarming season over, and colonies rapidly building up to full strength, beekeepers can now concentrate on the production of honey. Present indications point to a prosperous season and, with a world-wide demand for sugar and other sweets, good prices for honey should hold for at

least another year. In the meantime, bee-keepers would be well advised to organize the home markets—the market that has proved to be the most reliable in the past; and when world supplies again become normal, with a possible fall in prices, these home markets must again become the main support of the bee-keeping industry.

During the past few years the demand for honey has been greater than the supply, and high prices have been obtained for some samples of honey which in pre-war days would have been almost unsaleable. The production and marketing of such honey proved to be profitable in most cases, not only because the consumers relished it, but because they had no alternative owing to rationing of other competitive foods. With the drift back to normal conditions and a full supply of butter, jams, and canned fruits, honey will have to meet competition on its own merits. To acclaim honey as a valuable food without placing it before the consumer in its most attractive form, is simply a waste of words.

Some of our honey, such as that obtained from Red Gum and Yellow Box, may be classed amongst the finest in the world, but there is a growing tendency amongst bee-keepers and distributors to prevent the finer grades of honey reaching the consumer, by blending them with poorer grades to make an average-quality product. This practice may be justified only where continuity of a supply of a certain quality is demanded.

To increase the demand on the home market, consumers should have a choice of the finest grades. This would lead to a variation in prices with the producer of the finest grades being adequately rewarded for his work and choice of bee pasturage. The producer with an established market and a reputation for quality, can pass through periods of glutted markets.

[J. W. THOMLINSON, Apiary Inspector.]

AERIAL SPRAYING TESTS *(continued from page 558)*

D.D.T. from aircraft was used, but following unsatisfactory results, modifications were made to the method of dispersion and to the selection which resulted in satisfactory control being obtained.

The experiments were continued against the Australian Plague Locust and satisfactory results were obtained with a triple-spray bar, which is described, and a 4 per cent. solution of benzene hexachloride (13 per cent. gamma isomer) in diesel fuel oil. Methods of conducting field trials, the importance of the volatility of the solvent carrier, and of particle size are discussed. A Beaufort Mark IX aircraft has been used throughout the trials and has been modified to carry 520 gallons of solution.

The method is now in use on a large scale against an outbreak of locusts in Northern Victoria.

ACKNOWLEDGMENTS

A project of this nature has necessarily involved many persons and organizations, and it is difficult to adequately acknowledge the co-operation from all concerned. Numerous members of the staff of both the R.A.A.F. and Department of Agriculture have assisted in the field tests and their helpful co-operation has been greatly appreciated. The first modification of the aircraft was made by the Aeronautical Division of the Council for Scientific and Industrial Research, and the subsequent modifications, and the one at present being used, were developed by the Aircraft Performance Unit of the R.A.A.F. Advice on the measurement of particle size was received from the Chemical Warfare Section of the Munitions Supply Laboratories and the use of their equipment for laboratory tests was of invaluable aid in improving the insecticidal solution. The co-operation at Gunnedah of the N.S.W. Dept. of Agriculture, in one of the early tests against the hopper stage of the locust, was greatly appreciated.

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VEGETABLE GROWING IN THE HOME GARDEN

By GEORGE HYAM, Horticultural Supervisor

This is the fourth article of a series dealing with the growing of vegetables in the home garden. Previous instalments appeared in the August, October, and November issues of the Journal.

SOME LESSER KNOWN VEGETABLES

There are several vegetables commonly used in other countries which are seldom grown in Victoria. None of them however, are difficult to grow in this State and any or all of them would give additional variety to our vegetable diet. Those described hereunder are selected as being particularly suitable for Victorian conditions.

Mustard and Cress

These are the easiest and quickest of all salad plants to grow. Mustard and cress are always used in conjunction, and they are eaten when still in the two-leaved seedling stage. Their seed is sown thickly on the surface of soil contained in shallow trays used for seed-boxes. Cress is ready for use in about four weeks from sowing, and mustard which takes less time, is sown a week later. There is no need to sow either in the open, the crop being harvested directly from the boxes, which can be kept on a verandah. The little plants are cut off at ground level with scissors, taking care that their stems and leaves do not become gritty, as they are eaten raw, without washing. Mustard and cress can be sown in succession all-the-year-round.

Watercress

Watercress is often found growing wild in streams, but garden-raised watercress is very superior in flavour, its young leaves and stems making it an excellent salad plant. Running water is not essential; it can be grown in a moist trench. Watercress can be planted by cuttings, root division or from seed. Any piece will strike readily in wet ground. Take out a trench 2 ft. wide and 1 ft. deep in a shady position.

Watercress may be propagated by cuttings or root division. Lower: the cutting inserted; centre: the cutting after striking, with centre removed; top: root division from an old crown.

Dig in a 6-inch layer of rotted manure and trample the bottom of the trench firmly. Fill in 3 or 4 inches of soil on the top of this and fill the trench with water 24 hours before sowing or planting.

Watercress seed is sown in spring or autumn; and cuttings or divisions may be planted during the spring, and in the autumn, spacing the plants about 3 inches apart. As the stems grow to 6 or 8 inches high, cut off the top 3 or 4 inches for use as a raw salad. Past this stage, watercress is hot and stringy. The bed should be renewed every year, otherwise the stems become coarse and woody. The trench should be flooded at least once a week during growth; then it will yield throughout the year.

Salsify, the Oyster Plant

Salsify is a welcome break from the ordinary root vegetables. In habit, salsify is much like parsnip, and it is cultivated in the same way and sown at the same times. Salsify makes a delicate soup which has an oyster-like flavour, or it can be cooked like parsnip. The roots store well in the ground, or in clamps as for other roots. The best time for sowing is in early spring from August to the end of September and it does best in a deep soil that has previously been well manured for leaf crops without any additional fertilizer. Sow in shallow drills; cover the seed with ½ inch of soil and thin the plants to 4 inches apart. Salsify will be ready for use in five or six months from seed and the roots will store in or out of the ground for five months. Scorzonera is a root which is a near relative of salsify and is grown in exactly the same way but its flavour is different, being somewhat sweet, like parsnip. It is used and cooked like parsnip.

Before use, both salsify and scorzonera roots should be gently scraped to remove only a thin layer of peel, and then placed in water containing a little lemon juice, before cooking.

Okra

The bean-like pods of Okra are useful for flavouring stews and they give consistency and flavour to soups. The soil is prepared as for sweet corn, and the plant being frost sensitive, seeds are best sown in October. Sow the seeds in rows, 3 or 4 inches apart and 2 inches deep, afterwards thinning out the plants to 15 inches apart. The rows should be spaced 24 inches apart. The pods form at the leaf joints, and these should be picked when 3 or 4 inches long, before full maturity. Okra pods can be used green, or they can be dried by threading on string like red capsicum for use at other times. No special manuring treatment is necessary.

THE HERB BED

Every garden, however small, should have its herb bed. All made-up dishes such as stews, soups, and sauces are improved by the addition of a few leaves of one or more of the culinary herbs added judiciously by the cook. Fresh herbs impart a flavour that is impossible to attain by oils or synthetic essences or even from dried herbs, although properly dried herbs are the next best substitute. Culinary herbs may be grouped into those used in cooked dishes, such as sage, thyme, marjoram, parsley and mint, and those used in salads such as shallots, garlic, and chives.

Most herbs are perennial and may be grown in any convenient place, as they grow reasonably well in any soil or situation, and do not require manuring, except perhaps, for an occasional dusting with blood and bone. It is more convenient to the cook to establish a permanent herb bed handy to the kitchen door, but some of the herbs make attractive borders to vegetable beds, particularly raised beds, where they help to hold the soil along the edges.

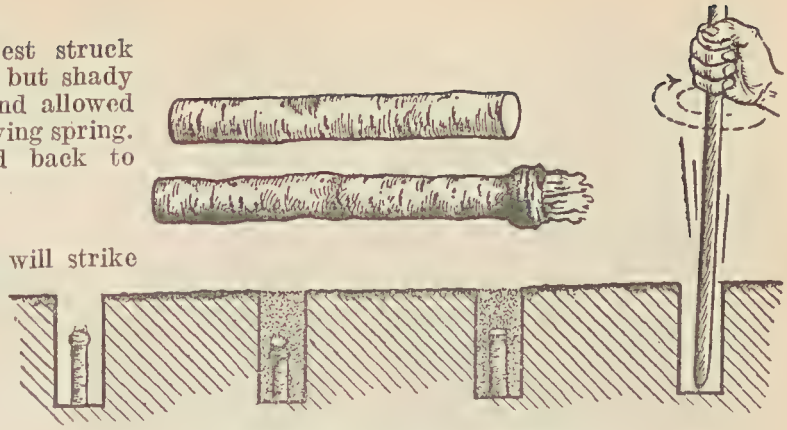
Two or three plants of the main perennial herbs is sufficient for the average household, and a bed measuring about 12 ft. x 4 ft. will accommodate sufficient of those described hereunder.

Sage, Thyme, and Marjoram

These three herbs are the ingredients of packets of mixed dried herbs and their uses are well known. All can be grown from seed sown in August, September, and transplanted or thinned out in October, November.

Sage and Marjoram are spaced 12 to 15 inches apart. Thyme has a prostrate habit and should be allowed a little extra room or planted on the margins of the garden bed. These herbs are also easily struck from cuttings taken from side shoots about 4 inches long, which have a small heel of older wood attached to their base. Old plants can

be divided. Cuttings are best struck in August-September, in open but shady beds, spaced 6 inches apart and allowed to remain there until the following spring. Their tops should be nipped back to induce bushy growth.



Method used for planting horseradish. Cuttings may be with or without crown, but should be straight.

Mint

Any portion of a mint plant will strike readily. As it spreads rapidly by means of underground runners it is apt to become a nuisance unless confined by boards around the plants. It is often more convenient to plant mint cuttings in a deep box of soil rather than in a bed, particularly as mint requires much more water than other herbs. Mint does best when the soil is kept in a sodden state. Mint can be struck at any time, except during winter.

Horseradish

The Horseradish is a rooted plant which requires a deep soil without added manure. To ensure nice straight roots, select straight pieces of root about 4 inches long, which have been cut squarely across at both ends. Drop these into holes 10 inches deep, afterwards ramming the soil around them. The plants should be spaced 12 inches apart. Planting should be done during the winter months from June to August when the roots will be ready for use from December onwards. Horseradish should be lifted every year, taking care that no portion of the root is left behind. Pieces of root left in the soil will grow on and increase, but the plants from these will develop into forked roots that are practically unusable. Horseradish can be shredded and dried for storage in jars.

Savory

This plant is not well known here, but both the winter perennial kind or "summer" savory, which is an annual plant, have a delightful flavour. The savorys seem to combine the flavours of sage, thyme and marjoram and consequently, make an excellent seasoning without any other herb in combination. Winter Savory can be grown from seed, cutting or division like sage, but summer savory is always sown from seed. The plants are spaced 15 inches apart.

Tarragon

Tarragon has many uses. It is used for flavouring vinegar and sauces and imparts an agreeable acid taste to salads. Tarragon is propagated like other perennial herbs. It should be cut frequently to keep the plants bushy.

Parsley

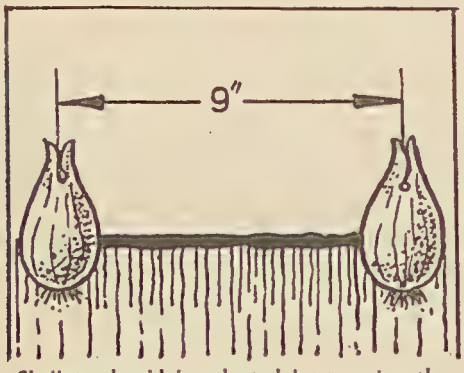
This plant is probably the most used of all herbs and its value as a source of vitamin C is being increasingly recognized. Parsley is a biennial plant, that is, it will run to seed the second year, or under Victorian conditions, it tends to seed every spring. For this reason, it is advisable to make annual sowings in the spring. Parsley prefers a deep soil and enjoys semi-shade. Its seed is slow in germination, often taking about eight weeks before the plants appear. The seed is sown in shallow drills, ½ inch deep in August-September. Germination can be accelerated by covering the drills with a light board or paling until it comes through. Parsley is intolerant of overcrowding and the plants should be thinned out to at least 6 inches apart. It must be kept well watered; if allowed to get dry, it will probably run to seed.

The foliage of all the herbs abovementioned, except that of the horseradish, should be picked regularly, even if it not is required for use, so as to induce new shoots. Surplus leaves can be dried by tying them in small bunches, and allowing these to dry out in the shade of an airy shed. The dry leaves are then rubbed off the stems and kept in air-tight containers. For drying, the leaves are best picked in the cool of early morning when the essential oils or flavours are at their highest. On no account should herbs be allowed to flower unless they are wanted for seed production.

The Salad Herbs

The best known of the salad herbs are the bulbous plants of the onion family such as Chives, Shallots, and Garlic, but there are many others like Chicory, Dandelion, Purslane, and Salad Burnet, all of which are interesting additions to any raw salad. No garden should be without Chives. It grows in clusters and in appearance it looks like a cluster of small spring onions without bulbs, and is used in the same way; or when chopped, as flavouring for cooked dishes. Chives will grow from any portion of the root and soon increase, the grass-like leaves being cut off with scissors at ground level as required, the plant continuing to grow on. Every second year, the clumps, which should be planted about 10 inches apart, are lifted and divided. Chives can be planted at any time, divisions of an old clump being used as sets.

Shallots are equally useful. Their leaves are used as for spring onions when young, or they are allowed to grow on to form bulbs which can be used as for onions, either for cooking or for pickling. Shallots are raised by planting the off-set bulbs. The best time to plant is during June and July. The soil should be well trodden down, and the bulbs pushed into the ground at 9-inch intervals, so that their necks are just above the surface. Each bulb if left to grow on will produce from eight to ten bulbs equal in size to a pickling onion. If planted too deeply or in too loose a soil, the side shoots will fail to form bulbs but the foliage will still be usable for salads. The bulbs are lifted for storage as soon as the foliage withers in early January and are dried off as for onions. Shallots will keep without sprouting until August.



Shallots should be planted by pressing the bulbs half-way into the firm soil as illustrated.

Garlic is raised by planting individual cloves in the same way and at the same time as shallots, except that the cloves are buried about 1 inch deep. Garlic is only used in the dried form and the clusters of cloves are lifted when the foliage withers These are dried off and stored like onions.

WATERING VEGETABLES

No vegetable can be grown to perfection unless it receives ample moisture throughout its growing period. Any check due to lack of water will result in stunted growth and coarse texture, even if the plant survives. Water well before preparing the surface finally for sowing, and lightly water after sowing. In hot weather, water lightly once or more each day with a fine spray until the seedlings are about 1 inch high. In cool weather keep the surface moist with less frequent waterings. When the plants are firmly established, water heavily and deeply once or twice a week, rather than by daily light sprinklings. Most crops are better watered by a furrow than a sprinkler, especially lettuce in the cool months, and excepting peas or beans which do better by overhead watering. When furrow-watering is done from a high-pressure town water-supply, place the nozzle of the hose in a short length of down-pipe, preferably fitted with an elbow, so that the water hits the sides of the down-pipe. This breaks the force of the stream and prevents the soil scouring. After a hot, dry, windy day, sprinkle the whole garden in the evening to restore the wilted foliage.

Sprinklers should be fitted with a fine spray. Heavy sprays tend to pack the surface, which results in a poorer penetration.

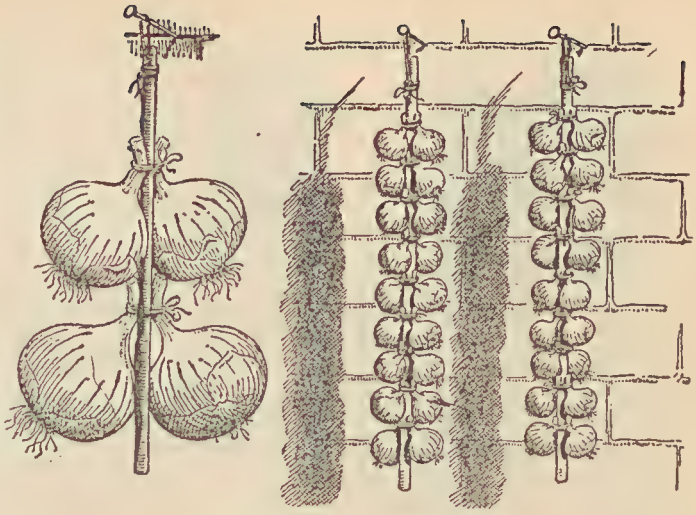
The vegetable garden needs more water than the flower garden to keep it in vigorous growth.

THE STORAGE OF SURPLUS VEGETABLES

As far as possible, all vegetables should be used as soon as they are gathered, but some can be stored or otherwise preserved without much deterioration in food value or flavour.

All root crops—except white turnips, can be lifted and held for some weeks, or they can be left in the ground until they show signs of seeding.

Leaf crops cannot be stored except by drying. Tomatoes and rhubarb can be bottled. Beans can be salted down. The preservation of vegetables, other than tomatoes or rhubarb by bottling at home is not recommended. This is because investigations have revealed that vegetables may be infected with the organism, *Clostridium botulinum*. This organism is not destroyed by sterilization at the temperature of boiling water and, in sealed bottles and tins containing non-acid products such as vegetables and meats, may produce a poison so powerful that the smallest taste of the infected contents may cause death.



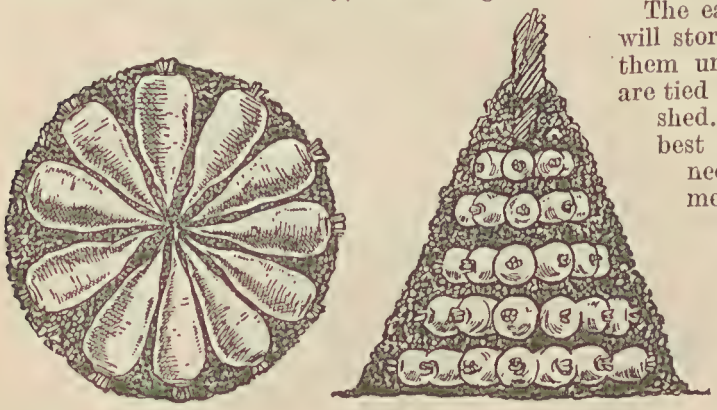
A handy method of storing onions.

Don't take the risk of bottling vegetables. Preserve them with safety by salting, drying, or pickling.

The above warning does not apply to the bottling of fruits, tomatoes, or rhubarb. This is quite safe and is recommended.

Carrots, parsnips, red beet, swedes, salsify, and potatoes in small quantities are best stored in single layers in boxes of dry sand or sifted ashes. Larger quantities are best held in "clamps."

The clamp is made by selecting a site in the open where water will not lie. A foundation is made by putting down a 1-inch layer of sifted ashes to form a circular bed. On this bed the roots are placed one by one, the crowns being placed outwards. When the bed has been covered with roots one layer deep, these are covered with sifted ashes or dry sand. Other layers are constructed in the same way, decreasing the circumference of the pile with each layer so that it finishes as a conical heap. Give a final covering of sand or ashes about 3 inches deep and finish off with a 3-inch layer of straw or bracken, then a layer of earth well packed down.



Root crops may be stored in "clamps" as illustrated (see text). Note provision made for ventilation down the centre of the clamp.

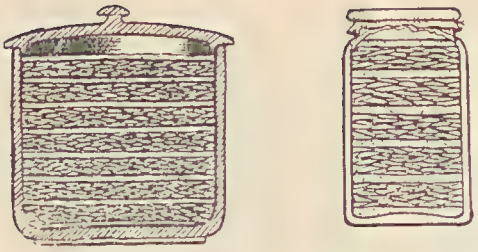
Ventilation of the centre of the pile is essential and this can be arranged by inserting a twisted bundle of straw 2 inches thick and about 12 inches long, so that it reaches the top layer of roots. The sides of the clamp must be steep so as to shed water freely and a small gutter should be made around the heap to drain the water away.

Replace the covering when roots are taken out for use. Before clamping, the roots should be dry on the outside and their foliage screwed off—not cut off—about 1 inch from the crown. No roots with broken skins should be included.

The earlier non-keeping kinds of onions will store for some weeks if, after curing them until the foliage is quite dry, they are tied to sticks and hung up in an airy shed. The late-keeping onions will store best on wire-netting shelves with their necks placed downwards through the mesh, preferably in single layers.

Pumpkins, Squash, and Marrows

Pumpkins, squash and marrows store best if picked when the vines start to wither. They should be cut off with about 2 inches of stem attached. If the stem is removed, rots will soon occur at this point. These vegetables



Beans can be held for winter use by preserving in salt (see text hereunder).

should never be stored on the ground or in the open, but in a place under cover where the air can get round each fruit. They should be protected from mice or rats.

French and Climbing Beans

French or climbing beans can be readily preserved by salting. Young, fresh, and tender beans only should be used. Leave the beans whole, wash thoroughly and allow to dry. Place a ½-inch layer of salt at the bottom of a stoneware jar, or any other non-metallic container, then a layer of beans. Cover the beans with salt and continue this alternate layer until the jar is full, finishing with a final layer of salt. About 1 lb. of salt should be used for every 3 to 4 lb. of beans, but do not skimp the salt if more seems to be needed. When the jar is full, cover and leave for a day or two. The layers will sink a little and generally there will then be room for another layer or two of beans and salt. Always leave a layer of salt on the surface, adding salt from time to time if this disappears.

Finally, cover the container with an air-tight covering, such as greaseproof paper or cellophane.

Before using the beans from the salt, soak them in several changes of water for two hours before cooking.

Other vegetables can be pickled or dried and methods for doing this will be found in the Department's Fruit Preserving Bulletin. This book may be obtained on application to the Director, Department of Agriculture, Melbourne, C.2, for the sum of 1s.

For those who have domestic refrigerators all vegetables will store well at a temperature of 40 to 45 degrees. Leaf vegetables and tomatoes are best covered with greaseproof paper, but not so as to entirely exclude air circulation.

DO NOT PLANT OUT OF SEASON OR GROW MORE THAN YOU CAN HANDLE

Plan all plantings according to your own special circumstances. The following series of tables are included to assist the home grower in deciding what to plant and when to plant it.

The accompanying map of Victoria shows in broad outline, the three main climatic zones, within which, in general, the planting times are similar. There are of course, areas in each zone, due to some special conditions such as elevation, rainfall or proximity to the coast which may differ from the general conditions of that zone, and local experience will indicate any variation in planting times or varieties for such areas. Aspect is another factor. Easterly and northerly slopes in hill country will be a week or two earlier than sites facing west or south in the same district. Crops that are shaded for part of the day take a longer time to mature.

Tables showing crops which give the highest yield in relation to space and those requiring the least labour are included for the benefit of those whose space and time are limited.

By looking down the monthly columns of the graphs showing the period when the different crops can be sown, the reader may see at a glance, what crops can be planted during any given month in each zone.

A large portion of the failures of vegetable crops in the home garden can be attributed to sowing too early or too late, or planting the wrong variety for the season.

Planting tables showing the most suitable home-garden varieties of every vegetable grown in Victoria; the time they should be planted, the spacing and method of planting, are also included. The planting distances shown are the minimum which will give the best results under home garden conditions which are usually a little less than for commercial crops. Don't overcrowd the plants. The vegetables are graded out in priorities which indicate those which should be given preference in small gardens.

The tables dealing with pest control, which will appear in the concluding instalment of this series, should be carefully studied by all gardeners.

The State of Victoria divided into the three main vegetable planting zones.

Not only should immediate crops be planned before planting, but the successional crops should be planned at the same time to ensure proper rotation.

THE VEGETABLES THAT YIELD MOST

(In proportion to the space they occupy and the number of pickings they will produce.)

1. Tomatoes
2. Climbing Beans
3. Kale
4. Brussels Sprouts
5. Broccoli
6. Onions
7. Dwarf Beans
8. Red Beet
9. Parsnips
10. Carrots
11. Silver Beet
12. Lettuce
13. Turnips
14. Leeks
15. Asparagus
16. Cabbage
17. Cauliflower
18. Potatoes
19. Peas
20. Rhubarb

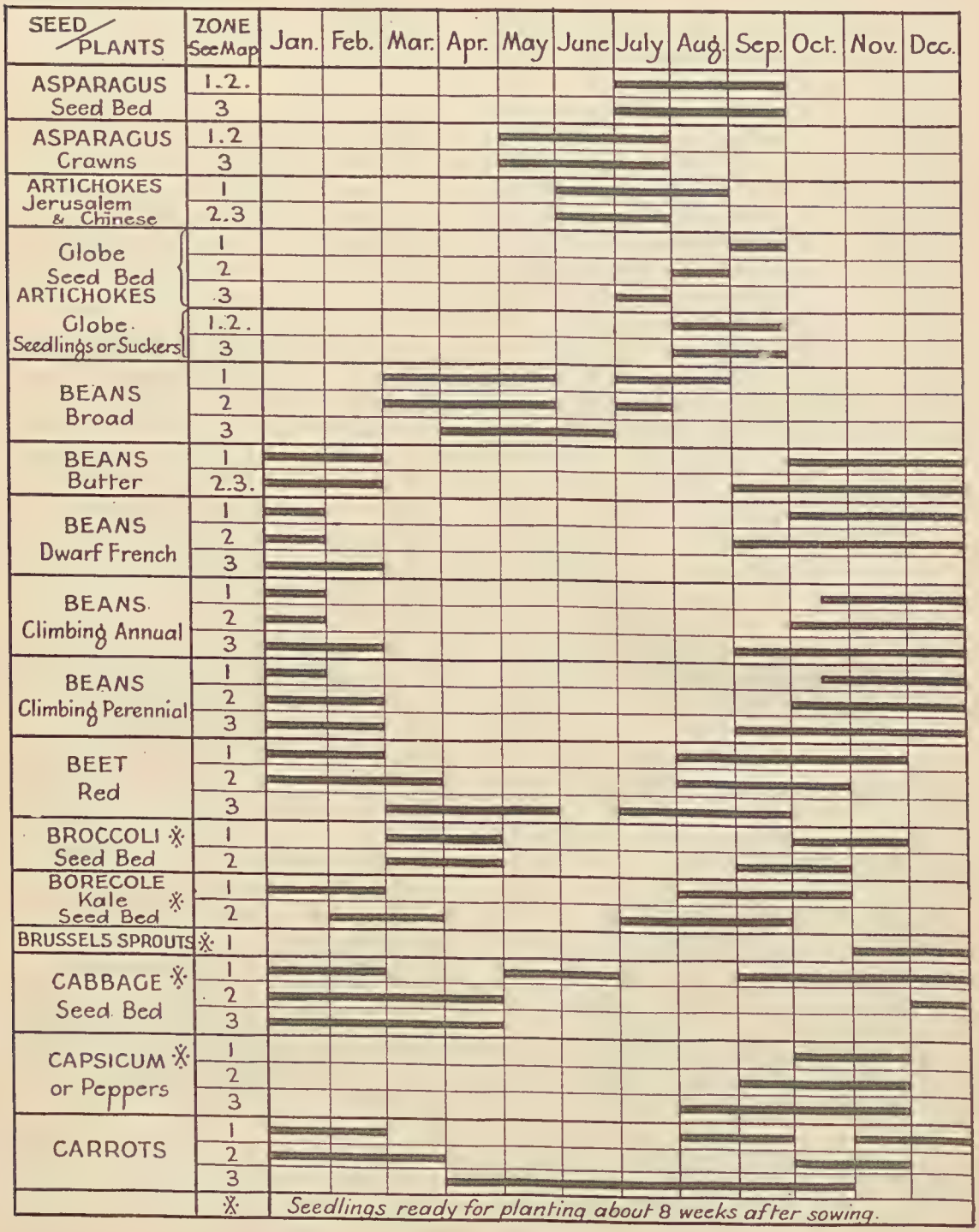
VEGETABLES WHICH REQUIRE THE LEAST ATTENTION FOR THEIR CULTIVATION

(Those requiring the least care are shown first.)

1. Vine Vegetables of all kinds
2. Rhubarb, Asparagus. Culinary Herbs (when established)
3. Radishes
4. Artichokes
5. Potatoes
6. Peas
7. Silver Beet, Chinese Cabbage
8. Sweet Corn
9. Beans
10. Broccoli, Kale
11. Brussels Sprouts
12. Cabbage
13. Cauliflower
14. Lettuce
15. Turnips, Onions, Leeks
16. Parsnips
17. Beetroot
18. Carrots
19. Tomatoes
20. Celery

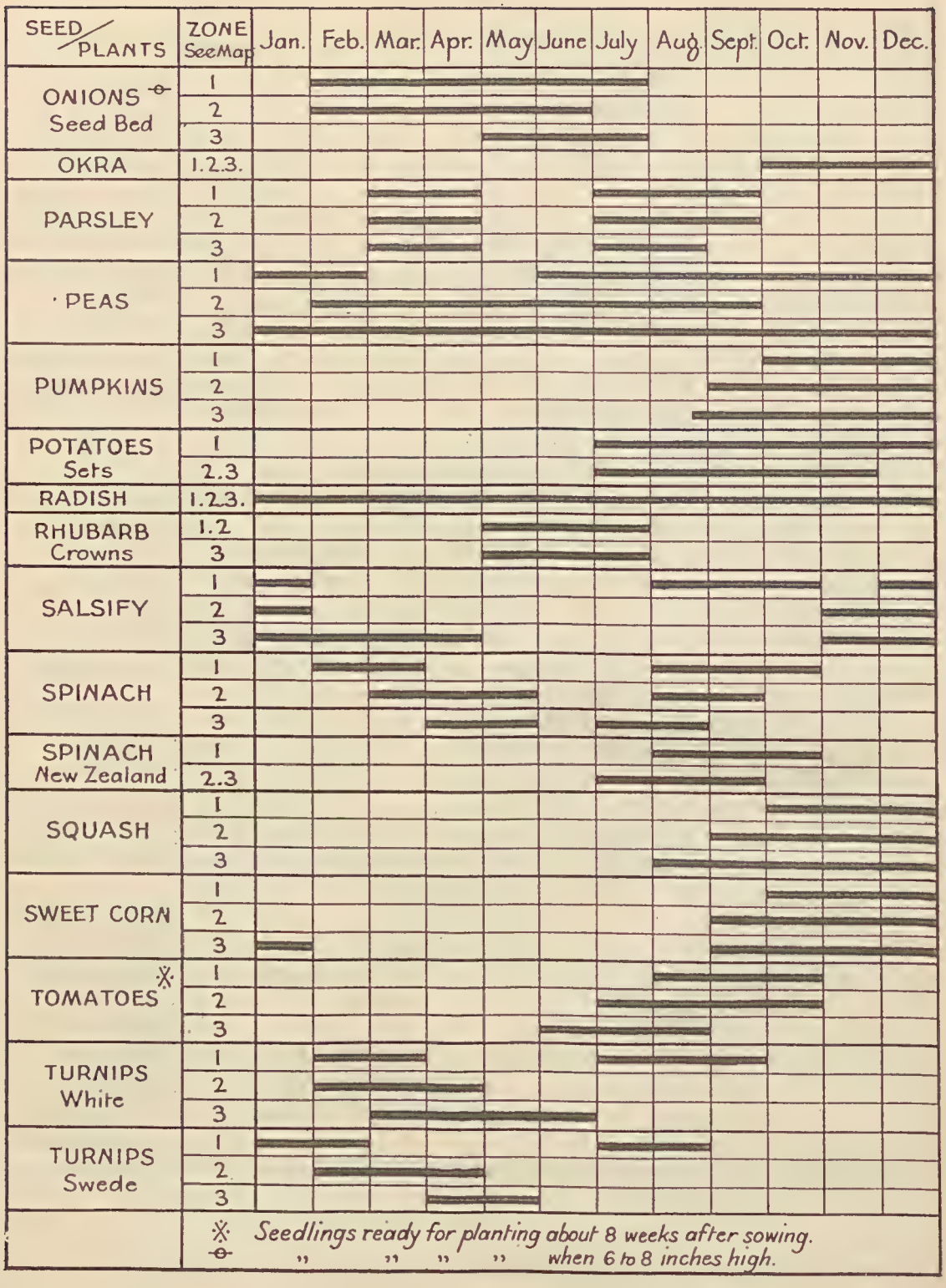
WHAT CAN I PLANT THIS MONTH ?

Sowing and planting months for each vegetable are shown in the diagrams. For details as to appropriate seasonal varieties, planting distances, etc., refer to the planting tables, pages 573-575.



SEED / PLANTS	ZONE See Map	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
⁂ CAULIFLOWER	1												
	2												
	3												
CELERY ♆ (Seed Bed)	1												
	2												
	3												
CHINESE ⁂ CABBAGE Seed Bed or Direct	1												
	2												
	3												
CUCUMBER	1												
	2												
	3												
ENDIVE Seed Bed or Direct	1												
	2												
	3												
EGG PLANT ⁂ Seed Bed or Direct	1												
	2.3												
HERBS: *Perennial Seed*	1.2												
	3												
HERBS: *Perennial* Root Division — Cuttings or Seedlings	1.2												
	3												
KOHL-RABI *Turnip Rooted Cabbage* ⁂ Seed Bed	1												
	2												
	3												
LEEKS ⊖ Seed Bed	1												
	2												
	3												
LETTUCE ⁂ Seed Bed or Direct	1												
	2												
	3												
MARROWS	1												
	2												
	3												
MELONS Water, Rock & Preserving.	1												
	2												
	3												
MELONS Cassaba	1												
	2												
	3												
MUSTARD & CRESS	1.2.3.												

⁂ *Seedlings ready for planting about 8 weeks after sowing*
♆ " " " " " 13-15 " " "
⊖ " " " " *when 6 to 8 inches high.*


SEED / PLANTS
ZONE See Map
Jan.
Feb.
Mar.
Apr.
May
June
July
Aug.
Sept.
Oct.
Nov.
Dec.
ONIONS Seed Bed
OKRA
PARSLEY
PEAS
PUMPKINS
POTATOES Sets
RADISH
RHUBARB Crowns
SALSIFY
SPINACH
SPINACH New Zealand
SQUASH
SWEET CORN
TOMATOES
TURNIPS White
TURNIPS Swede
1
2
3
1.2.3.
1.2
2.3
Seedlings ready for planting about 8 weeks after sowing.
" " " " when 6 to 8 inches high.

PLANTING TABLE FOR HOME GARDENERS IN VICTORIA

PLANTING TIMES MAY BE EXTENDED A WEEK OR TWO EARLIER AND LATER WITH LESS CHANCE OF SUCCESS.

Order of Priority. (See foot-note.)	Crop. Variety.	Best Time to Sow Seed. Zone 1.	Zone 2.	Zone 3.	Method of Sowing or Planting.	Depth of Sowing.	Distance between Seeds.	Distance between Rows.	Distance between Plants.	Time to Thin or Transplant after Sowing.
						inches.	inches.	ft. in.	ft. in.	
2	**ASPARAGUS.** Mary Washington, Connover's Colossal	Aug.–Sept.	Aug.–Sept.	Aug.–Sept.	Seed bed	¾	..	1 6	1 4	Crowns May–July.
	ARTICHOKES.									
2	Jerusalem ..	Tubers June–Aug.	Tubers June–July	Tubers June–July	Tubers	6	..	3 0	1 6	Suckers or Plants
2	Chinese	Tubers June–Aug.	Tubers June–July	Tubers June–July	Tubers	3	..	3 0	1 0	Suckers or plants
3	Globe	Sept.	Aug.	July	By suckers or seed in seed bed	1	4	3 0	3 0	Suckers or plants Sept.
	BEANS.									
1	**Broad.** Dwarf Prolific .. Leviathan ..	Mar.–May, July–Aug.	Mar.–May July	Apl.–June	Drills	2½–3	9	3 0	0 9	..
1	**Butter.** Startler Wax .. Brittle Wax ..	Oct.–Feb.	Sept.–Feb.	Sept.–Feb.	Drills	1–2	5	1 3	0 5	..
1	**Dwarf French.** Brown Beauty .. Hawkesbury Wonder Feltham Prolific .. Staley's Star ..	Oct.–Jan.	Sept.–Jan.	Sept.–Feb.	Drills	1–2	5	1 3	0 5	..
1	**Climbing (Annual).** Epicure ..	Late Oct.–Dec.	Oct.–Jan.	Sept.–Feb.	Drills	1–2	9	3 0	0 9	..
1	**Climbing Perennial.** Scarlet Runner .. White Czar .. White Mammoth..	Late Oct.–Dec.	Oct.–Jan.	Sept.–Jan.	Drills	1–2	9	3 0	0 9	
1	**BEET (RED).** Early Wonder .. Detroit Dark Red	Aug.–Nov. Jan.–Feb.	Aug.–Oct. Jan.–Mar.	July–Sept. Mar.–May	Drills	¾–1	1	1 0	0 4	2" high
2	**BROCCOLI.** Green Sprouting ..	Oct.–Nov. Feb.–Apr.	Sept.–Oct. Feb.–Apr.	Not suitable	Seed bed	½	..	2 6	2 0	8–10 weeks
2	**BORECOLE (KALE).** Green Curled ..	Aug.–Oct. Jan.–Feb.	July–Sept. Feb.–Mar.	Not suitable	Seed bed	½	..	2 0	1 6	8 weeks
1	**BRUSSELS SPROUTS.** Fillbasket ..	Nov.–Dec.	Not suitable	Not suitable	Seed bed	½	..	2 6	2 6	8 weeks
2	**CABBAGE.** St. John's Day .. Succession .. East Ham .. Savoy .. .. Parisian ..	Sept. Oct. Late Jan. Jan.–Feb. May–June	Dec.–Jan. Jan.–Mar. Feb. Feb. Mar.–April	Not suitable Jan.–Feb. Late Feb. Late Feb. Mar.	Seed bed	½	..	2 6	2 0	8–10 weeks
3	**CAPSICUM (Peppers).** *Mild*— Ruby King .. Chinese Giant .. *Hot*— Small Chili .. Long Cayenne..	Oct.–Nov.	Aug.–Oct.	July–Oct.	Seed bed or direct. 3 seeds to station	½	ft. 2	3 0	2 0	8 weeks after sowing
1	**CARROTS.** Osborne Park .. Hawkes Strain (for Spring planting) Red Chantenay .. Short Horn .. Danvers ..	Aug.–Sept. Aug.–Sept. Nov.–Feb.	Oct.–Nov. Jan.–Mar.	April–June July–Oct.	Drills	½–¾	..	1 0	0 3	2" high

The numbers on the left of the table suggest the probable value of the crops to the home gardener:—

1. Indicates crops which should be in every home garden.
2. Indicates crops requiring more space and greater attention to pest control, or useful alternatives to certain crops in Group 1. The larger garden could well contain a selection of these.
3. Indicates crops which should not be planted to the exclusion of crops in Groups 1 and 2.

PLANTING TABLE FOR HOME GARDENERS IN VICTORIA—*continued.*

Order of Priority. (See foot-note.)	Crop. / Variety.	Best Time to Sow Seed. Zone 1.	Zone 2.	Zone 3.	Method of Sowing or Planting.	Depth of Sowing.	Distance between Seeds.	Distance between Rows.	Distance between Plants.	Time to Thin or Transplant after Sowing.
						inches.	inches.	ft. in.	ft. in.	
2	**CAULIFLOWER.**									
	Green Leaf ..	Dec.	Jan.	..	Seed bed	½	..	2 6	2 6	8 weeks after sowing
	Phenomenal ..	Jan.	Late Jan.	Feb.						
	Late Metropole ..	Feb.	Early Feb.	Late Feb.						
3	**CELERY.**									
	Golden Self-branching	Sept.–Nov.	Aug.–Sept.	July–Aug.	Seed bed	¼	..	3 0	0 6	13–15 weeks after sowing
	White Plume ..									
2	**CHINESE CABBAGE.**									
	Pe-tsai	Sept.–Oct.	Oct.–Feb.	Oct.–Mar.	Seed bed or direct. 3 seeds to station	¾	..	2 0	1 6	8 weeks after sowing
	Wong-Bok ..	Jan.–Feb.								
2	**CUCUMBER.**									
	Green Prickly Apple	Oct.–Dec.	Sept.–Dec.	Late Aug.–Dec.	3 seeds to hill	1½	4	4 0	3 4	..
	Crystal Apple ..									
	Heinz Pickling (Gherkin)									
2	**ENDIVE.**									
	Green Curled ..	Jan.–Mar. July–Aug.	Mar.–Apl.	Apl.–June	Seed bed or drills	½	..	1 0	0 10	6 weeks after sowing
3	**EGG PLANT.**									
	Purple	Oct.–Nov.	Sept.–Nov.	Sept.–Nov.	Seed beds or direct. 3 seeds to station	½	2	2 6	2 0	8 weeks after sowing
1	**HERBS.**									
	Culinary ..	(See text.)								
2	**KOHL-RABI.**									
	Purple	Aug.–Sept.	Feb.–Mar.	March	Seed beds or drills	½	...	1 3	0 8	8 weeks after sowing
	Green	Jan.–Mar.								
1	**LEEKS.**									
	Lyons	Feb.–Apl.	Mar.–Aug.	Mar.–Apl.	Seed beds	½	..	1 3	0 8	6"–8" high
	London Flag ..	Sept.–Nov.								
1	**LETTUCE.**									
	Imperial 847 ..	Nov.–Feb.	Nov.–Feb.	Aug.–Sept.	Drills	½	..	1 6	0 10	2" high
	Imperial D ..	Mar.–May	Mar.–May	April–May	Seed beds or drills					
	Cos									
	Webb's Wonderful									
	New York ..	July–Sept.	June–Aug.	May–June						
	Imperial 615 ..									
	Iceberg	Oct.–Nov.	Aug.–Oct.	July–Aug.	Drills					
	Imperial 44 ..									
2	**MARROWS.**									
	White Bush ..	Oct.–Dec.	Sept.–Dec.	Aug.–Dec.	3 seeds to hill	1–2	6	3 0	3 0	3" high
	Green Bush ..									
3	**MELONS.**									
	Water—									
	Keckley's Sweet Cuban Queen ..	Oct.–Nov.	Oct.–Dec.	Sept.–Dec.	Sown direct. 3 seeds to hill or raised in tins	1–2	6	6 0	5 0	3"–4" high
	Rock—									
	Rocky Ford ..	Not Suitable	Oct.–Dec.	Sept.–Dec.		1–1½	6	4 5	4 0	
	Stillman's Netted									
	Cassaba—									
	Honey Dew ..	Oct.–Nov.	Oct.–Dec.	Nov.–Jan.		1–2	6	6 0	6 0	
	Preserving—									
	Red-seeded ..	Oct.–Nov.	Oct.–Nov.	Sept.–Dec.		1–2	6	6 0	5 0	
	Citron ..									
1	**MUSTARD.** (See Text.)									
	ONIONS.									
1	Early Flat White ..	Feb.–Mar.	Feb.–Mar.	Mar.–May	Seed bed	½	..	1 0	0 5	6" high
	Silverskin ..									
2	Odourless ..	Apl.–May	Mar.–Apl.	Apl–June						
	Early Globe ..									
2	Brown Globe ..	May–June	May–June	Apl.–June						
3	Australian Brown	June–July	May–June	May–June						
	White Imperial Spanish									

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						inches.	inches.	ft. in.	ft. in.	
3	**OKRA.** (See Text.)									
	PARSLEY.									
	Triple Curled ..	July–Sept. Mar.–Apl.	July–Sept. Mar.–Apl.	July–Aug. Mar.–Apl.	Drills	½	..	1 0	0 10	2″ high
1	**PARSNIP.**									
	Melbourne White..	Aug.–Oct.	July–Sept.	Apl.–June	Drills	½	..	1 3	0 3	2″ high
	Hollow Crown ..	Dec.–Jan.	Dec.–Jan.	Aug.–Oct.						
2	**PEAS.**									
	Dwarf.									
	Melbourne Market (Wm. Massey)	June–Aug.	Feb.–June	Mar.–May	Drills	1½–2	3	1 3	0 2	..
	Greenfeast ..	July–Dec.	June–Sept.	June–Feb.						
3	Yorkshire Hero ..	Nov.–Feb.	Sept.–Oct.							
2	**Climbing (5 ft.)**									
	Telephone ..	July–Dec.	June–Sept.	May–July	Drills	1½–2	4	2 6	0 4	..
3	**PUMPKINS.**									
	Turks Cap ..	Oct.–Dec.	Sept.–Dec.	Late Aug.–Dec.	Sown 3 seeds to hill or raised in tins	1–2	6	6 0	..	3″ high
	Triamble ..									
	Queensland Blue..									
3	**POTATOES.**									
	Carman No. 1 ..	July–Sept.	July–Sept.	July–Sept.	Deep Furrows	5	..	2 6	1 3	..
	Katahdin ..									
	Sebago									
	Carman No. 3 ..	Oct.–Dec.	Sept.–Nov.	Sept.–Nov.						
	Up-to-date ..									
1	**RADISH.**									
	Long Scarlet ..	All months	All months	All months	Drills	¾	..	0 10	0 1½	3 weeks
	White Icicle ..									
	French Breakfast									
2	**RHUBARB.**									
	Wilson's Ruby ..	Crowns in May–July	Crowns in May–July	Crowns in May–July	See text	..	..	3 0	2 6	..
	Topp's Winter ..									
	Stone's Everbearing									
3	**SALSIFY.**									
	Mammoth ..	Aug.–Oct. Dec.–Jan.	Nov.–Jan.	Nov.–April	Drills	¾	..	1 0	0 4	8 weeks
2	**SPINACH.**									
	Prickly	Feb.–Mar.	Mar.–May	April–May	Drills	¾	2	1 0	0 6	8 weeks
	Round Seeded ..	Aug.–Oct.	Aug.–Sept.	July–Aug.	Drills	1	6	3 0	2 0	8 weeks
	New Zealand Spinach	Aug.–Oct.	July–Sept.	July–Sept.						
2	**SQUASH.**									
	Table Queen ..	Oct.–Dec.	Sept.–Dec.	Aug.–Dec.	Sown 3 seeds to hill or raised in tins	1–2	4	4 0	4 0	3″ high
	Green Hubbard ..									
3	**SWEET CORN.**									
	Golden Bantam Cross	Oct.–Dec.	Sept.–Dec.	Aug.–Jan.	Sown 3 seeds to hill	1–1½	4	3 0	1 6	8 weeks to one plant
	Country Gentleman									
1	**TOMATOES.** (See Text.)									
	Early	Aug.–Sept.	July	June–July	Seed bed	½	..	Staked 2 0 Unstaked 3 0	Staked 1 6 Unstaked 2 6	8 weeks
	Midseason ..	Sept.	July–Aug.	Aug.						
	Late	Oct.	..	..						
	TURNIPS.									
2	*White*—									
	White Stone ..	Feb.–Mar.	Feb.–Apl.	Mar.–July	Drills	½	..	1 0	0 4	3″ high
	White Egg ..	July–Sept.								
3	*Swedes*—									
	Laing's Garden	July–Aug.	Feb.–Apl.	Apl.–May	Drills	½	..	1 3	0 6	3″ high
	Purple Top ..	Jan.–Feb.								

The numbers on the left of the table suggest the probable value of the crops to the home gardener:—

1. Indicates crops which should be in every home garden.
2. Indicates crops requiring more space and greater attention to pest control, or useful alternatives to certain crops in Group 1. The larger garden could well contain a selection of these.
3. Indicates crops which should not be planted to the exclusion of crops in Groups 1 and 2.

FAMILY SUPPLY TABLE

The time taken to reach maturity, the period over which the crop may be used, and the approximate length of row required at each planting to supply a family of five are shown in the following table:—

Crop.	Time from Planting to Maturity.	Period of Usage in Fresh State.	Storage.	Quantity per Planting for Family of Five.
	Weeks.			Feet of row.
Carrot	16–18	16th–26th week	3 months	30
Parsnip	20–24	18th–30th week	3 months	30
Red Beet	10–12	10th–20th week	3 months	20
Silver Beet	8–12	Continues to crop for period up to 6 months with main crop in winter and spring	..	15
Spinach	8–10	6th–12th week	..	20
Lettuce and Endive	8–12	6th–12th week	..	25
French Beans	10–12	10th–14th week	Dried or salted	30
Climbing Beans	10–12	10th–26th week	Dried or salted	10
Broad Beans	18–20	18th–26th week	Dried or salted	20
Peas	12–16	12th–16th week	..	30
Tomatoes	16	16th–25th week	In bottles	12 plants
Cabbages	16–20	14th–21st week	2 weeks	18 plants
Cauliflowers	16–20	16th–21st week	2 weeks	18 plants
Brussels Sprouts	16	May to Sept.	2 weeks	12 plants
Chinese Cabbage	8–12	Continues to crop for six months	..	18 plants
Borecole (Kale)	10	Continues to crop for six months	..	6 plants
Green Sprouting Broccoli	16–20	16th–30th week	..	12 plants
White Turnips	12–13	10th–14th week	4 weeks	30 feet of row
Swede Turnips	16	14th–18th week	8 weeks	50 feet of row
Radishes	6–8	6th–8th week	..	6 feet of row
Onions—				
Early White, Silverskin, Odourless, Early Globe	28–32	24th–36th week	6–8 weeks	50 feet
Brown Globe and White Imperial	32	25th–32nd week	20 weeks	72 feet of row
Australian Brown	32	25th–32nd week	30 weeks	72 feet of row
Leek	35	25th–35th week	Dried	30 feet
Pumpkins	14–17	12th–20th week	5 months	5 groups
Squashes	14–17	12th–20th week	3 months	6 groups
Marrows	14–17	12th–20th week	2 months	6 groups
Potatoes	21	Jan.–May	4 months	70 plants
Jerusalem and Chinese Artichokes	40	May–July	3 months	10 plants
Celery	20	16th–24th week	..	20 plants
Sweet Corn	12–16	12th–16th week	..	12 plants
Shallots	34	..	Dried	24 plants
Rhubarb	60	Wilson's Ruby—Sept.–Mar. Topp's Winter—Mar.–Aug. Stone's Everbearing—Aug.–Mar.	In bottles	6 plants
Asparagus	65	Sept.–Dec.	..	40 plants

The concluding instalment of this series, dealing with control of vegetable pests, will appear in a subsequent issue of the Journal.

APRICOT CULTURE

By G. W. GAYFORD, B.Agr.Sc., Horticultural Instructor.

APRICOTS do not form a large proportion of the Victorian fruit acreage but are none the less important, 4,800 acres being grown in this State.

The apricot is a valuable fruit because of the various uses to which it can be put. As a canned fruit it is more highly nutritious and richer in vitamin A than any other fruit grown in Victoria. Apricot jam is popular, and dried apricots are excellent for stewing and jam making. There is also a big demand for apricots as fresh fruit.

Apricots grow satisfactorily under a wide range of climatic conditions, but best production occurs in a warm climate with a 20 to 25 inch rainfall. The flowers are self-fertile, but cold showery weather during the blossoming period affects the setting of the fruit. The open blossom and small fruit up to ½ inch in diameter are highly susceptible to frost damage, and this precludes the growing of apricots when there is a definite risk of late spring frosts. Showery weather during the spring and early summer make the control of the fungous diseases shot hole or scab, and brown rot very difficult, and apricots should not be grown in districts where these conditions are normal.

DISTRICTS

Goulburn Valley is probably the most important apricot district, where the fruit is grown under irrigation, mainly for canning but also for fresh fruit and drying. The heaviest and most regular production occurs in this area, where the climate is favorable for this kind of fruit.

Geelong and Werribee—At Werribee, apricots grow well on alluvial silty loam soil under irrigation. The Geelong district is suitable for the cultivation of apricots without irrigation. The fruit is grown in these areas mainly for canning, jam, and fresh fruit.

Metropolitan Area.—Apricots are of minor importance in the metropolitan district, where they are grown mainly for the fresh fruit market.

Wimmera.—Apricots are grown in the vicinity of Horsham and Quantong. The warm climate suits the growth of the fruit, but the main difficulty in this district is that the crop has been considerably reduced by late frosts in recent years.

Murray Valley.—Early varieties may be grown in the Mildura and Swan Hill districts and forwarded to the Melbourne market during late November and early December, when other kinds of fruit are scarce. These districts are also suitable for drying apricots.

ROOTSTOCKS

For apricots to be grown on light sandy soils, the peach seedling stock is favoured. For heavy clay or clay loam soils, the plum rootstock, preferably Myrobolan, gives satisfactory results. For rich soils in which the drainage is satisfactory apricots give best results when grown on apricot seedling rootstocks.

VARIETIES

It can be stated that the list of suitable varieties available for canning purposes at the present time is far from satisfactory. The mid-season varieties are the only ones suitable for canning, and they come to maturity in the period 20th December–4th January. It would be preferable to have other suitable varieties coming before and after this period in order that the

harvest and processing period could be extended. The search for suitable varieties from seedlings or crosses is included in the programme of work at the Department's Horticultural Research Station, Tatura.

The following is a list of the main canning and market varieties of apricots.

Mid-season Ripening

Trevatt is the outstanding variety grown at the present time for canning purposes. Of good flesh colour, it ripens evenly and is a regular bearer.

Tilton is a good canning variety, but is going out of favour because of tendency to produce small fruit of inferior flavour.

Shipley's (*Blenheim*).—A heavy bearer of good quality fruit, similar to and difficult to separate from Trevatt.

Moorpark is a medium bearer of good-flavoured fruit, but this variety suffers from the disadvantage that one side of the fruit ripens before the other and this makes it unsuitable for canning. Other varieties suitable for the fresh-fruit market include *Mansfield, Alsace, Campbellfield Seedling, Turkey* and *Hemskirke.*

Early Ripening

Oullins is an early variety of good colour, but poor flavour.

Newcastle variety ripens towards the end of November, and is grown in the Mildura and Swan Hill districts for the early market.

Glengarry variety is also grown in the Murray Valley because of its earliness. It produces larger fruit than Newcastle.

PLANTING OUT

June and July is the best time for planting out apricot trees. The tops and roots should be pruned back before planting. As the apricot grows into a large tree, the most suitable distances for planting are 24 ft. x 24 ft. In an exposed situation, it is advisable to plant windbreaks at the same time or, if possible, before the new plantings, particularly on the south-western side, to protect the trees from cold winds.

PRUNING

The object in pruning during the early years should be to obtain a strong framework of 8 to 10 well-placed main limbs. These are obtained by allowing two yearling shoots to remain on every growth from the previous year, cutting these yearling shoots back to about one-third of their length each year until the desired number of main limbs is obtained. The framework of the tree should be established within three or four years, after which each branch should be allowed to elongate by removing all but one of the strongest yearling shoots and cutting this one back to a bud pointing in the desired direction. By controlling the growth in this way, fruit-bearing wood will be produced in the lower parts of the tree in contrast to a tree which is "let go" and produces most of its fruit at the ends of the limbs.

Fruit is borne mainly on yearling shoots and short spurs which arise from older wood. Provision should be made for the renewal of this type of wood by cutting back the yearling wood after it has fruited to a suitable bud and lightly thinning out the short spurs.

CULTIVATION AND IRRIGATION

The normal programme of cultivation for deciduous trees should be adopted for apricots. Spring cultivation should be completed before blossoming, when the green manure crop and the spring application of fertilizers should be ploughed under.

Summer cultivation is required to control weed growth, which would otherwise compete with the trees for soil moisture. Because the crop is removed earlier than most other fruits, it should be possible to plant a green manure crop in February or early March, and thus ensure successful establishment.

Irrigation methods will vary, of course, according to the district and soil types on which the trees are grown and growers should be guided by local practice. It should be mentioned here that some of the trouble in poor cropping of apricots is due to failure to watch the moisture requirements of the tree once the fruit is removed.

FERTILIZERS

A suitable fertilizer programme for apricots should consist of 2 to 3 cwt. per acre of nitrate of soda or sulphate of ammonia before flowering. This quantity may be increased for big trees grown under irrigation. Use of excessive nitrogen is to be avoided, however, as it renders the fruit and twigs more susceptible to brown rot. The green crop should be sown in February or March with 2 cwt. per acre of superphosphate.

HARVESTING

Because all the main varieties of apricots mature during the same period, harvesting is a critical time for the apricot grower, and this factor limits the size of the block which one grower can handle. Harvesting is a tedious job because of the small size of the fruit, and is considerably slower than for peaches or pears. Fruit should be firm and ripe when picked for processing or market.

Details concerning the drying of apricots are given in the publication "Drying of Tree Fruits", which is available free on application to the Director, Department of Agriculture, Melbourne, C.2.

SPRAYING

The two diseases which cause most damage to apricots are shot hole or scab and brown rot. The former disease causes holes in the leaves and brown scabs on the skin of the fruit rendering it unfit for processing. For the control of this disease, a spray of Bordeaux mixture 6 : 4 : 40 should be applied at the "pink bud" stage in the spring and again when the leaves are falling in the autumn. Brown rot causes rot in the fruit and sometimes attacks blossom and twigs. Bordeaux mixture at the "pink bud" stage, and again when the white petals commence to show, will reduce the damage due to this disease. Sprays containing sulphur or copper cannot safely be applied to apricots at a later stage than the "white petal" stage. In the control of brown rot it is important to collect and destroy all "mummies" (old infected fruit remaining on the trees or lying on the ground) as these are capable of carrying over the disease from one season to the next.

THE FLOWER GARDEN

By T. H. KNEEN, B.Agr.Sc., Principal
School of Horticulture, Burnley Gardens

THE WINTER DISPLAY

IT may seem out of place to be thinking now of the winter flower display when all our efforts in the past few weeks have been directed to furnishing beds for the summer and autumn; beds which will continue to flower until frosts cut the plants down. Of course, there are some that will continue to flower into early winter, especially if they are planted in warm and sheltered positions. It may have been necessary to remove many winter and spring flowering plants just past their prime in order to make way for the summer and autumn annuals.

While the winter and spring flowering annuals require cooler conditions for their full growth and development than do most summer growing plants, they will develop but slowly in the cold winter months, and instead of reaching the full development of which they are capable before blooming, will respond to the improved conditions in early spring by going straight into the blooming phase. Some plants respond specifically to the increasing length of day and will not bloom otherwise. There are others equally in need of a decreasing amount of illumination. Not all plants, however, behave in this rigid way.

The general aim with flowers for the winter display is to take full advantage of the favorable growing conditions of autumn to enable them to be well-established before the cold weather sets in. This in turn means that seeds of plants such as calendula, pansy, viola, stocks, nemesia, cineraria, primula, winter-flowering sweet peas, and Iceland poppies must be sown in January for transplanting in March. They will then be well established by the end of May, and will provide between them a good supply of blossom during the winter and spring months. Seedlings which are self-sown are not usually forward enough in their development for winter blooming, as they do not become established until conditions are favorable in early autumn.

Seed beds should, therefore, be put in order for sowings next month of winter-flowering annuals. The main point to remember is that the weather in January is not very suitable for sowing seed, and protection must be given the young seedlings during the hotter part of the day. This can be provided by using hessian screens or brushwood, &c.

Seeds of ranunculus and anemone may be sown in January for excellent bedding effects in the spring. They will be at their best about the end of October.

DAHLIAS

Early December is recognized as being the most suitable time for planting dahlias in the Melbourne area, mainly because blooms from earlier plantings do not relish the mid-summer heat. Most gardeners will be planting tubers, but they could also set out green plants as supplied by nurserymen. The latter are raised under glass in early spring by setting out tubers in a moist sand bed. This treatment forces the dormant buds into growth, and tip cuttings are rooted in sand and finally transferred to pots in which they are sold. This method has the advantage of enabling more plants to be produced, a point of considerable importance with valuable varieties.

Green plants require more careful treatment when planting out. Before attempting to remove the plant, water it well and allow the pot to drain. Invert the pot on the open hand, running the plant between the fingers, and tap the rim on some solid ledge. The whole plant should come away with the ball of earth intact, and the roots undisturbed. Press the pot into the loose soil at the base of the stake to form a hole for the plant. Water the plants well, label, and provide light shade for a few days.

When dividing clumps of tubers, make sure that each tuber carries a bud or young shoot. Tubers not showing these may produce shoots if kept in a warm, moist spot, and just covered with soil. Shoots should be cut back to just above the basal bud. Plant the tubers about four inches deep, with the bud or shoot near the stake. There is no need to water until the young shoots have appeared above ground.

Stakes should be set out during the final soil preparation stages. Allow a spacing of three feet and use, for preference, jarrah stakes, one inch by one inch, five to six feet in length, and driven in twelve to eighteen inches, making due allowance for the height of varieties chosen.

It must not be forgotten that dahlias are gross feeders and will respond to heavy dressings of well-rotted stable manure, compost, &c., dug in when preparing the ground, together with a dressing of three to four ounces per square yard of blood and bone manure. When the plants are reaching full development, it will pay to apply a mulch of strawy stable manure to maintain even moisture conditions in the surface soil.

The following list of dahlia varieties may be helpful to those not familiar with the many proved named sorts available:—

Decorative Types—

Giant Informal—Jane Cowl
Pop Harris

Miniature Stiff-stemmed—Betty Goodall
Gold Rose

Cactus Types—

Berri
Burnette Highlight
Tilbury's Starlight
Violet Mackinnon
Kensington Flame
Mrs. D. A. Swanston
Mascotte

Charm Types—

Leider's Miniature
Bishop of Llandaff
Ranunculus

EELWORM SCAB OF POTATOES

By H. A. J. PITMAN, B.A., B.Sc.Agr., Dip. Ed., *Plant Pathologist, Biological Branch*

IN many Victorian potato-growing districts considerable damage is caused to potato crops each year by the eelworm, *Heterodera marioni*. In these districts up to 50 per cent. or even more, of potatoes may be rendered unfit for market as a result of the nodular swellings on the tubers caused by this microscopic worm. The trouble is not confined to the potato plant however, as several pasture species and weeds are affected by the eelworm. During a survey on eelworm in 1944–45 by G. H. Mattingley, Potato Expert of the Department, and the writer, eelworm was found on Flatweed, Capeweed, Evening Primrose, Scarlet and Blue Pimpernel, various species of thistle including the Black Thistle, Subterranean Clover, Perennial Red Clover, Chickweed, Prickly Lettuce, Wild Poppy, and to a lesser extent Charlock or Wild Radish.

Fig. 1. Tuber affected with Eelworm, showing typical wart-like swellings.

The importance of these plants in maintaining, or even increasing, the eelworm population in affected soil in the absence of potato crops is obvious. Instances have occurred where land which had produced an eelworm-affected crop some twenty years previously and had since been under pasture, has given a badly affected crop when again broken up and again planted to potatoes. The trouble is also spread by the undesirable practice of feeding eelworm-infested tubers to cattle and other live stock on clean pasture land. The eelworm thus introduced into the soil soon finds a suitable host plant and if the land is subsequently broken up and planted to potatoes it will rarely fail to produce an affected crop.

The eelworm is most commonly met with on light well-drained sand, or sandy loam soils or light, dry ridges in volcanic country, and occurs less frequently on wet, badly-drained, peaty soils or heavy clay land.

Symptoms

Potato tubers affected with eelworms are easily detected by the presence of nodular or wart-like swellings on their surface (Fig. 1). Often these are few in number, but in severe cases the entire surface or the tuber may be covered with these protuberances. The mature female worms, which cause these swellings, are found in clear areas, embedded up to about ¼ inch in the tissue of infected tubers when cut across (Fig. 2). These worms are large enough to be just visible to the naked eye and are white in colour and pear-shaped, with a distinct neck or head region.

On the true roots of potato plants, as distinct from the tubers, the eelworms cause the typical "root knots" or white swellings (Fig. 3). These swellings may be very numerous and resemble irregular blisters or beads, and cause large irregularities in the width of affected roots at various points. These root-knots also are the typical symptoms of eelworm attack on other host plants such as those named above.

The effect of eelworm attack on the above-ground portions of the potato plant may be small. Sometimes the plants are

Fig. 2. Section of potato tuber showing typical internal injury caused by the potato Eelworm.
[After N.Y. Agr.Exp.Stn. B. No. 667.

slightly stunted, but under other conditions, although the tubers may be heavily infested, the plant may appear normal.

Life History of the Eelworm

The eggs of the eelworm are so small as to be invisible without the use of a microscope. These eggs hatch into small larvae, which are round and thread-like and very small. The larvae then make their way to the still undeveloped tubers, and penetrate the skin, taking up a position just underneath the surface. Larvae hatching from eggs in infected tubers, first burrow out of the old tuber into the surrounding soil, and are then able to infest the roots of other plants. The larvae are capable of travelling short distances in the soil by their own exertion. Before penetration into the tubers, the sexes are indistinguishable, but soon afterwards they become distinct. The male remains round and thread-like, but the female, after fertilization, enlarges enormously and becomes somewhat bladder-like. A single female may contain as many as 500 eggs.

The wart-like protuberances on the potato are produced as a result of the irritation set up by the eelworm in the tubers. The eggs and larvae may survive in the soil for a period up to two years. Owing however, to the large number of different species of plants attacked by the worm, and to the fact that it does not exhibit any marked degree of specialization as to the particular plant it attacks, it will remain indefinitely in an infested area, unless steps are taken to control it.

Control Measures

A considerable amount of work has been done in the control of eelworms in various parts of the world. Many of the methods suggested, however, such as chemical treatment of infected areas, are so expensive as to be impracticable on a commercial scale. The following methods while not completely eradicating the pest, have proved of definite value in its control.

1. *Fallow.*—It has been shown that a two-year fallow is very satisfactory in the control of eelworm in the soil. It is absolutely essential, however, that all weed growth be rigorously suppressed, as weeds may harbour the organism and so defeat the purpose of the fallow. If this is done the larvae of the eelworm will be starved to death, as they are unable to live for any considerable time in the soil without the food material supplied by some suitable living plant.

While this method is the most satisfactory control measure available, it is unlikely, for economic reasons, that it would be adopted to any extent in Victoria.

2. *Rotation.*—Growers have found that serious attacks of eelworm have followed the practice of growing potatoes continuously on one area. In addition, the eelworms often cause severe losses in potatoes following pasture. This, of course, is due to the fact that many pasture plants are hosts for the worm, enabling it to persist, and even multiply in the soil. For this reason also, the sowing down of infested land to pasture is an unsound method of dealing with the pest. Any crops grown in rotation with potatoes should be immune to eelworm attacks. Owing to the enormous host range of the parasite, the number of such plants which are suitable for rotation purposes is very limited.

Most varieties of wheat, oats, barley, and rye are resistant to eelworm attack, and it has been observed that, under

Victorian conditions, a rotation in which a summer-growing cereal such as spring-sown oats is followed by another winter-growing cereal such as autumn-sown rye, which is ploughed in or fed off before planting potatoes, gives a satisfactory control of the eelworm. Winter-grown cereals alone are not entirely satisfactory in eradicating eel-worm, as the pest is more or less dormant during the winter months.

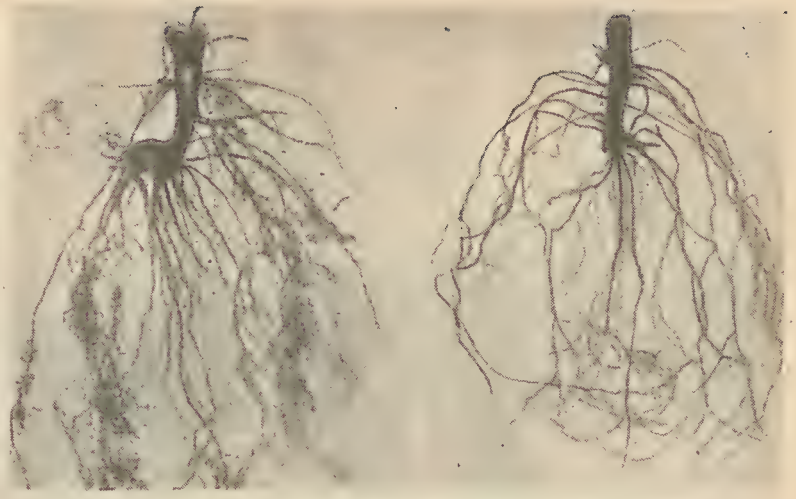

Fig. 3. Left: Roots of a potato plant infested with eelworm. Right: Root system of a healthy plant.
[After N.Y. Agr.Exp.Stn., B.No. C67

3. *Seed Selection.*—Owing to the difficulty of completely eradicating eel-worm, once it has become established in the soil, growers should take every precaution to ensure that they do not introduce the pest by means of infested seed. All seed showing the characteristic wart-like swellings typical of eelworm infestation should be discarded for seed purposes, and only clean seed should be used for planting.

By way of warning, it should be stated that it has been a common experience of growers in all parts of Victoria that the planting of eelworm-infested potatoes may give a clean crop in the season of planting. It is unfortunate that this feature of the trouble has contributed largely to the use of infected tubers for seed purposes. The growing period of the new crop of potatoes is too short, in most cases, to enable the eelworms within planted mother tubers or sets to emerge into the soil and infect new *tubers* formed during the same season. However they most certainly infest the *soil* and remain there as a source of trouble and economic loss for the next or subsequent potato or other susceptible crop.

4. *Varietal Susceptibility.*—It has been observed that tubers of the Snowflake variety are very highly resistant to eelworm. This variety has therefore been used successfully to produce clean tubers on badly infested potato land or newly-ploughed infected pasture land. However, it has been further observed that the Snowflake variety is actually susceptible to eelworm attack on the true roots. For this reason the use of this variety on eelworm-infested land, even though clean tubers may be produced, will not lead to eradication of the eelworm population in the soil.

The varieties, Carman, Up-to-Date, and Manistee are very susceptible to eelworm attack, while Katahdin, Pink-eye and Delaware are less susceptible. However, much experimental study is needed before definite statements can be made regarding the relative degree of susceptibility or resistance of many varieties commonly grown in this State.

5. *Avoidance of Conditions Favourable to Heavy Infection.*—The following conditions aggravate the trouble:—Shallow ploughing, deep planting, compaction of the sub-surface soil, and delayed digging at the end of the season after the tops have died down.

It is advisable to leave as wide a time interval as possible between the ploughing up of a pasture and the planting of potatoes, as early sown crops are much more susceptible than the same variety planted late in ploughed-up pasture land in the main Victorian potato-growing districts.

Seasons highly favourable to the disease in potato tubers, are those with hot, dry or droughty conditions in the early part of the summer, with heavy rains or thunderstorms occurring later when the soils are very hot and dry.

Fodder reserves on a Tongala farm.

property is in an entirely different category to those of the remaining exhibitors, being an old-established large holding devoted to stud-stock breeding. The scale on which it is operated is well exemplified by the size of the shed, capable of storing over 20,000 bales of hay.

At the time of judging the property was carrying 1,080 breeding ewes, 750 wethers and young sheep, 21 horses, 55 milking cows, 6 bulls, and 51 head of young cattle. With adjustments for sales and purchases since 1st March, 1946, stock units were calculated as 240. Fodder units were calculated as 246½, but were adjusted to a lower figure on account of the high ratio of "acres improved pastures" to "stock units" as compared with the average ratio for other competitors.

Quality of the fodder was uniformly good, and the exhibits included grain oats, lucerne hay, Wimmera rye-grass hay, wheaten, and oaten hay.

The second-prize winner's property was at the other extreme—a small intensively-worked property of 40 acres, owned by Mr. F. P. Pattison, Tongala, with an average annual water usage of 97 acre feet, and carrying 36½ stock units. Stored fodder totalled 33 units, and the carrying capacity was in the vicinity of 3 cows to 2 acres of improved pastures. Pasture hay, with white clover, rye grass, &c., was the most important item, and this was of good quality. Paddock feed was poor at the time of judging, indicating that the stored fodder had been at the expense of winter-grazing area. About 12 tons of oaten hay was also grown.

DETAILED RESULTS OF THE FIVE COMPETITIONS

KYABRAM

Competitor.	Section.	Quantity and Quality.	Green Crops and Paddock Feed.	Excess.	Suitability.	Condition of Stock.	Location and Protection.	Total.	Prize
Maximum Points ..	.. ..	80	10	60	15	10	25	200	—
Starritt, G. and Son, "Kelso Park," Moor-oopna	Mixed farming under irrigation	68	6	..	14	10	23	121	First
Pattison, F. P., Tongala	Dairying under irrigation	71	2	..	14	10	21	118	Second
Armstrong, A.T. and E. L. Tongala	Dairying under irrigation	50	9	..	11	10	21	101	Third
Bunn, C. A., Byrneside	Mixed farming under irrigation	45	4	..	14	10	21	94	
Till, J. A., Koyuga South	Dairying under irrigation	38	7	..	12	10	22	89	
Maher, R. and R. H., Tongala	Dairying under irrigation	39	6	..	14	8	21	88	
Collier, W., Tongala ..	Mixed farming under irrigation	37	5	..	11	10	23	86	

ROCHESTER

Competitor.	Section.	Quantity and Quality.	Green Crops and Paddock. Feed.	Excess.	Suitability.	Condition of Stock.	Location and Protection.	Total.	Prize.
Maximum Points ..	.. ..	80	10	60	15	10	25	200	—
Shale, J., Nanneella ..	Dairying under irrigation	77	7	34	13	10	21	162	First
Fehring, D.	Dairying under irrigation	76	4	26	11	10	22	149	Second
Christie, W., Fairy Dell	Dairying under irrigation	71	6	..	13	10	21	121	Third
Munzel, P., Nanneella ..	Dairying under irrigation	57	4	..	14	10	21	106	
Pierce, J. D., Rochester	Dairying under irrigation	54	5	..	14	10	22	105	
Cooper, M., Bamawm ..	Dairying under irrigation	48	6	..	13	10	22	99	
Fraser, A., Bamawm ..	Dairying under irrigation	42	7	..	14	10	20	93	
Haines, G., Lockington ..	Dairying under irrigation	31	9	..	13	10	22	85	

PYRAMID

Competitor.	Section.	Quantity and Quality.	Green Crops and Paddock Feed.	Excess.	Suitability.	Condition of Stock.	Location and Protection.	Total.	Prize.
Maximum Points ..	.. ..	80	10	60	15	10	25	200	—
Gronow, Mrs. A., Mincha	Mixed farming under irrigation	77	8	21	8	10	21	145	First
Miles, A. W., Mitiamo	Dairying under irrigation	77	5	16	8	10	21	137	Second
Thomas, C. F., Tandara	Mixed farming under irrigation	63	5	..	10	10	21	109	Third
Ladson, E. W., Macorna	Dairying under irrigation	59	8	..	8	10	21	106	
Wood, C. E. and Sons, Pyramid	Dairying under irrigation	53	5	..	14	10	21	103	
Gibson, G., Pyramid ..	Mixed farming under irrigation	52	4	..	14	10	21	101	
Gilmore, T., Yarrawalla	Mixed farming under irrigation	54	2	..	14	10	21	101	
Broad, J., Pyramid ..	Mixed farming under irrigation	53	5	..	7	10	23	98	
Hamley, H. J., Dingee ..	Dairying (irrigation)	40	6	..	14	10	21	91	
Lawry Bros., Tandara ..	Dairying (irrigation)	41	3	..	12	10	21	87	

COHUNA

Competitor.	Section.	Quantity and Quality.	Green Crops and Paddock Feed.	Excess.	Suitability.	Condition of Stock.	Location and Protection.	Total.	Prize.
Maximum Points ..	.. ..	80	10	60	15	10	25	200	—
Barr, H. M. B., McMillans	Dairying under irrigation	64	4	..	13	10	22	113	First
Schier, C. A., Mead ..	Mixed farming under irrigation	54	9	..	14	10	23	110	Second
Mathers, F. and T., Cohuna	Dairying under irrigation	58	4	..	14	10	23	109	Third
King, C. L., Cohuna ..	Dairying under irrigation	50	4	..	12	10	21	97	
Stone, H., Cohuna ..	Dairying under irrigation	44	7	..	13	10	22	96	
McDonald, A. D., Cohuna	Dairying under irrigation	46	3	..	14	10	22	95	
Fenn, J. C., Leitchville	Dairying under irrigation	45	3	..	12	10	21	91	
Hore, E., Horfield ..	Dairying under irrigation	34	8	..	12	10	21	85	
Cleave, T. R. and Son, Burke's Bridge	Dairying under irrigation	33	5	..	14	10	22	84	

Competitor.	Section.	Quantity and Quality.	Green Crops and Paddock Feed.	Excess.	Suitability.	Condition of Stock.	Location and Protection.	Total.	Prize.
Maximum Points ..	.. ..	80	10	60	15	10	25	200	—
Street and Hollingworth, Koondrook	Dairying under irrigation	72	2	..	12	10	21	117	First
Hollingworth, H. L., Koondrook	Dairying under irrigation	49	5	..	12	10	23	99	Second
Hall, G. G., Kerang ..	Mixed, irrigation	49	5	..	13	10	21	98	Third
McKenzie, A. E., Kerang	Dairying under irrigation	47	9	..	13	10	19	98	
McCarrey, J. E., Teal Point	Dairying under irrigation	42	6	..	13	10	21	92	
McKenzie, R. N., Myall..	Dairying under irrigation	34	7	..	12	10	19	82	
Matheson and McDonald, Kerang	Dairying under irrigation	32	7	..	12	10	19	80	

ROUNDWORMS IN SWINE

The large roundworm is the most troublesome of the parasites which infest pigs. It is a thick, yellowish-white worm which may measure up to a foot or more in length. The adult female roundworm in the small intestine of the pig may lay up to 200,000 eggs per day. These eggs pass out in the faeces and are ready to infest other pigs in about ten days. The eggs are not readily killed by cold or dryness and in muddy wallows may remain alive up to two years, but hot dry conditions such as exposure to direct sunlight in sandy soil will destroy them in a few weeks.

The eggs hatch in the animal's stomach and the young worms burrow through the walls of the small intestine. Although damage is done by mature roundworms to the walls of the small intestine, the most serious effects are due to the migration of the immature worms. Damage to lung tissue may result in a cough and unthriftiness, while suckers may develop pneumonia or the "thumps" and creep under the straw to die within a week or two after infection.

Oil of chenopodium is the most effective drug in the treatment for mature roundworms. After starving the patient for 24 hours administer in the following doses mixed with castor oil:—

For a 25-lb. pig—1 c.c. in 1 oz. castor oil;
For a 50-lb. pig—2 c.c. in 1½ oz. castor oil;
For a 75-lb. pig—3 c.c. in 2 oz. castor oil;
For a 100-lb. pig—4 c.c. in 2½ oz. castor oil;
For a 150-lb. pig—6 c.c. in 3 oz. castor oil.

The McLean County System of Piggery Management has been found successful in the United States for rearing pigs practically free from worms. This system relies on ridding the sow and the farrowing pens of worm eggs, and running the sow and litter, and later the weaners, in paddocks which have not carried pigs for two years. Details of the system are described in a pamphlet, "Internal Parasites of Swine," which may be obtained, free of charge, on application to the Director, Department of Agriculture, Melbourne, C.2.

[L. P. PREWETT, B.V.Sc., Veterinary Officer.]

TUBERCLE-FREE HERDS

ACCREDITED TUBERCLE-FREE HERDS

The following herds have been declared free of tuberculosis under the *Accredited Tubercle-free Herd Scheme* conducted by the Department of Agriculture. Under this scheme a tubercle-free accredited herd of cattle is one in which the entire herd has passed two negative, successive, annual physical examinations and tuberculin tests or upon disclosure of infection, three semi-annual, successive physical examinations and tuberculin tests applied by a State Veterinarian or by a qualified and registered veterinarian who is approved by the Chief Veterinary Inspector for that purpose.

Name.	Address.	Number in Herd.
Aboriginal Station	Lake Tyers	86
Armstrong and Son	Wangaratta	105
Ballarat Orphanage	Ballarat	121
Banyule Stud Pty. Ltd.	Wangaratta	55
Beggs, A. R.	Beaufort	116
Black, I. S., Estate of	Mount Noorat	59
Bleakley Bros.	Horsham	16
Candler, G. E.	Hamilton	23
Carne, W. J.	Pakenham Upper	30
Clark, W. J.	Monomeith	148
Cowan, G. L. S.	Bacchus Marsh	59
Cribbes, T.	Wangaratta	39
Deering, J. T.	South Wangaratta	86
Dennis, Mrs. A. A.	Frankston	11
Dookie Agricultural College	Dookie	92
Everist, F. R.	Tyabb	12
Foletta, G. G., and Son	Buxton	121
Geelong Grammar School	Corio	78
Gleeson, P. J., and Son	Tynong	261
Gorman, A. W.	"Cathcart," Alexandra	57
Griffin, G. W.	Gladysdale	50
Griffiths, J. G.	Benalla	151
Gross, Mrs. G. F.	Green Lake	23
Hamilton, A.	Flinders	67
Henry, J. A.	Warrnambool	45
Howlett, Mrs. G., and Miss E. Samuel	Lang Lang	70
Jakobi, L. W.	"Granada," Yannathan	89
Johnson, F. G.	Horsham	21
Judd, Mrs. D. R.	Broughton	16
Kingsley-Newell, F. J.	Shoreham	60
Lawrence, P. H.	"Rainga," Tarrawarra	83
Light, D. T.	Noradjuha	8
Longerenong Agricultural College	Dooen	39
Maloney, P. J.	Tongala	66
Maybery, A. H.	Horsham	16
Middleton, J. A.	Longwarry North	70
Murray, M. G.	Lima	26
McIntosh, J.	Merrigum	35
McKenzie, A. E.	Kerang	54
McNabb, G. A., and Son	Irrewillipe East	159
Nancarrow Bros.	Kerang	48
Nicholas, M. A.	Sherbrooke	78
Noonan, G.	Benalla	35
Noonan, Mrs. S. A.	Benalla	51
Northcote Children's Farm	Bacchus Marsh	48
Onley, W. H.	"Glenholme," Caldermeade	58
Parker, Mrs. L. M.	Tallarook	67
Payne, A. E. T.	"Yarra View," Lilydale	71
Payne, T. E. N.	"Woodburn," Kilmore	76
Poole, M. A., and D.	Caldermeade	125
Poole, M. A., and D.	Yannathan	104
Potter, W. J.	Longwarry North	130
Powell, T. S.	"Carellen," Mansfield	43
Reid, Mrs. B., Estate of	Bundoora	75
Richardson Bros., Messrs.	"Faldinghurst," Upper Beaconsfield	53
Roe, Thomas H. P.	Cobram	27
School of Horticulture	Burnley	6
Scott, F. E. Selwyn	Scotsburn	76
State Experiment Farm	Rutherglen	47
State Research Farm	Werribee	245
Stephens, Dr. F.	Vermont	40
St. Joseph's Home	Sebastopol	54
Vagg, T. R.	Officedale	40
Vagg, E. J.	Leongatha	48
Warnock, J. A.	Benalla	76
Waterhouse and Son	Pakenham	55
Wells, W. G.	Caldermeade	67

In addition to the above the following is a list of herds in their respective districts which have given negative reactions to two or more successive tests conducted by departmental veterinary officers, but inasmuch as replacement cows are only submitted to one test before being admitted to the herds, they cannot be considered as accredited under the Accreditation Scheme which requires, among other things, that no cow shall be admitted to the herds unless it has given two (2) negative reactions at an interval of 60 days, and must be kept in isolation during the period between the two tests.

District.	Herds.	Cattle.
Ballarat	119	2,757
Benalla	43	297
Bendigo	63	1,564
Broadmeadows	66	2,996
Colac	2	77
Doncaster	18	478
Geelong	131	4,179
Heidelberg	25	746
Horsham	7	382
Rutherglen	20	297
Traralgon	3	174
Wangaratta	45	438
Warrnambool	7	124
Whittlesea	119	5,432
Yallourn	4	370
Yarragon	35	1,656
Yea	30	82

There are also 310 herds in which 13,459 head of cattle have passed one test and may be considered, therefore, to be in process of becoming tubercle-free herds.